THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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BRITISH OVERSEAS TRADE AND THE WAR.

THE dislocation of the trade of a country which is taking part in a war of any magnitude is a foregone conclusion. Even if such a war is far removed from home, the withdrawal of both men and money from their normal employment is bound to have a far-reaching effect on the general industry and commerce of the country concerned.

The present European war in which Britain is participating bids fair to rival all previous conflagrations of the kind; not only has it closed the principal European markets, but its proximity to our shores threatens for the time being, at any rate, to interfere somewhat with our overseas trade to distant lands. Needless to add, no sane Britisher believes for one moment that British shipping to neutral or friendly ports will be subject to more than a very brief spell of dislocation from naval causes, but obviously some uncertainty must exist during the early days.

In any case, our insular position has much to recommend it from the point of view of commerce in a crisis such as the present one.

For our readers great interest naturally attaches to the probable course of events in the electrical trade, and while it is rather early to venture any forecast in a matter of this sort, we have ascertained the views of many leading electrical firms, of which we publish a summary on p. 242.

Moreover, so far as our export and import trade in electrical goods, &c., is concerned, the monthly tables which we publish may be studied with advantage.

These show that during the present year exports of British electrical goods have been somewhat in excess of half a million pounds a month, towards which amount European countries only contributed approximately £88,000 worth of purchases; this figure, of course, includes countries which are not directly engaged in war, and in any case it is not greatly in excess of our electrical trade with India alone.

The balance of our exports represents trade with countries far removed from the war; indeed, our best customers, as has frequently been pointed out, are found in India, Japan, Australia, Canada, and the South American Republics. The distribution of these customers is clearly shown in the map which we print on p. 243.

Our re-export trade of foreign and Colonial electrical goods has averaged in recent times some £26,000 a month; probably the greater part of such material originated on the Continent, and about £6,000 worth returned to European destinations each month.

When we turn to the imports into this country of electrical material, an entirely different state of affairs is found, as Germany's preponderating contribution to the total, which represents goods used in this country, will in future be missing, and this also applies to Austro-Hungarian business, which, however, only reaches small proportions.

In recent months we have imported, on the average, some £275,000 worth of foreign electrical material, and of this German imports into this country accounted for £156,000 a month on the average, and Austro-Hungarian for only £1,800 worth. France and Belgium contribute between £25,000 and £30,000 worth of electrical imports per month, and these will, doubtless, fall off greatly; the war, in fact, will affect all our serious competitors in the home market except the United States, which imported nearly £60,000 worth of electrical goods into this country in June. While the July imports, which we hope to publish in the course of a week or two, as usual, may not be appreciably affected, those for August, owing to the uncertainties of sea transport, are unlikely to reach more than diminutive proportions.

It is vitally important to ourselves that this country should emerge successfully from the present war, and it is

difficult to overestimate the valuable assistance towards this end, which those engaged in the industries and commerce of the country can render to the cause by keeping business going wherever possible. The British electrical industry would seem to be most favourably situated in this respect, for as we have shown, less than 20 per cent. of its overseas trade is concerned with Europe, and obviously a much smaller proportion with Germany, Austria-Hungary and Russia, the countries which may be regarded as absolutely sealed by the war.

On the other hand, Germany's important overseas electrical trade has been ruined for the time being, and it would seem that a great opportunity is presented to our manufacturers to neutralise loss of European trade by extended operations at the expense of our former competitors. This applies particularly to Great Britain itself, which, as we have said, has absorbed over £150,000 worth of German electrical goods a month in recent times, the absence of which must offer scope for the expansion of the internal electrical trade of the home manufacturer, with effects which should be not merely temporary, but permanent in character. We published in our issue of February 13th last (page 287) the official figures for German electrical exports during 1913, perusal of which, as indicating the directions in which business may lie, should be of interest.

We are at war, and it should be recognised that our industries, such as can be kept going, represent the indispensable reserve force on which both combatants and non-combatants depend—in fact, the mainstay of our national existence.

It is incumbent on us to use this weapon of industrial warfare in a time of stress, no less skilfully than those of our brothers in arms will be used when occasion arises.

Government Works.

We have been asked by the First Commissioner of H.M. Works to give publicity to the following announcement:—It appears from various inquiries addressed to the Commissioners of Works that there exists some apprehension lest unemployment should be increased in the building and other trades by suspension during the present crisis of building and engineering operations provided for in the estimates of the Office of Works recently approved by Parliament. It is, therefore, desirable to state publicly at once that it is the intention of the Commissioners of Works to proceed with all services in their charge, to employ as many men as possible to carry out such services, and to develop and expedite their building programme in any way practicable.

As the Minister mainly responsible for Government building the First Commissioner of Works wishes to take this opportunity of expressing his sincere hope that private individuals, companies, firms and contractors will spare no effort to follow the policy of the Government in this matter, so far as circumstances admit.

Trade Disputes Ended.

An immediate benefit derived from the declaration of war has been the settlement or postponement of all the great industrial disputes which were in progress in this country. On Saturday last the *Times* published a lengthy list of them, the most important, from our point of view, being those which took place in the building trades and the London electrical wiremen's strike. Credit is due to the Trade Unions concerned, which patriotically lost no time in advising their members to return to work; the employers were no less anxious to hasten the restoration of harmonious relations and the resumption of work, with a view to strengthening the national position.

The I.E.E. and the War.

We desire to call attention to the arrangements which have been made, with commendable rapidity, by the Council of the Institution of Electrical Engineers to place the services of members at the disposal of the War Office and the Admiralty. Particulars are given in our "Notes" columns. That the technical knowledge, experience, and ability of this great body of engineers should be of the highest value to the authorities at this time goes without saying, and we have no doubt that many of the members will gladly volunteer to help.

But the appeal is not directed to them alone; all electrical men are invited to apply, and we have pleasure in bringing to the notice of our readers generally the facilities provided by the Institution for this purpose. At the same time, we suggest that duplication and waste of effort should be avoided, and while the promptitude with which Mr. Ellerd-Styles took action in the same direction is worthy of all praise, we think he would do well to unite his forces with those of the Institution.

Rubber.

Whatever hopes may have been entertained that the rubber market was on the eve of better times have been very rudely dispelled by the outbreak of the general European war, and it is at the moment impossible to foresee how things are going to turn out. Production in the East is of course proceeding as usual, and presumably shipments will be coming along without much interruption when once the Mediterranean is cleared of German warships, which period can hardly be delayed for long. The mastery of the seas assured again, trade movements will be resumed as before, but with the important exception that the state of war everywhere will enforce war conditions, the effects of which upon rubber will probably entail reduced consumption. The world's trade must necessarily be checked by what is going on, and the wholesale destruction of life and property can only in the long run inflict great injury upon national prosperity. The greatest sufferer will be Germany, of course, for on the Continent this is the greatest of the industrial nations, and it will under the most favourable conditions take years for the restoration of ante-war conditions as regards this Power.

There can hardly be any doubt that there is an ample supply of rubber available for all purposes, and with the money market as it has been, the cessation of dealings publicly was the inevitable result. To this extent rubber has merely shared the misfortunes with which other leading commodities have been assailed. Under the circumstances the demand has not been worth considering, either on European or American accounts, and it will require time before the position can undergo any material improvement. Not only has the stringency of money had an influence in shaking confidence, but the jump in rates of Eastern exchange has acted equally in a depressing way upon the price of the commodity while all shipping movements are out of gear. The auctions which should have been held in London this week have of course been postponed indefinitely, and the attitude of both buyers and sellers is one of aloofness.

That rubber is playing a by no means unimportant part in the war, is shown by the repeated reports of the movement of bodies of troops by means of motor cycles and motor cars, and by the fact, too, that France has forbidden the exportation and re-exportation of tires, while similar action has been taken by the German authorities.

For the first six months of the year the quantities which were offered for sale by auction at Singapore amounted to 1,512 tons, the total sales being 1,267 tons, compared with 1,508 tons last year. The total area under cultivation in the Malay Peninsula is given officially as 708,545 acres, compared with 621,621 acres in the previous year, of which the totals for the Federated Malay States were 433,324 acres and 399,197 acres respectively. The Malayan output of rubber last year was 28,169 tons, against 18,956 tons in 1912.

The visible supply of rubber at the end of July was 3,375 tons, compared with 4,739 tons a year ago, and 5,105 tons in 1912. The receipts at Para last month were 1,340 tons, making 23,990 tons for the seven months, as against 25,010 tons last year and 25,290 tons in 1912.

RECENT EXTENSIONS AT NEWPORT, MON.

Additions to the generating plant at the East power station and to the converting plant at the Llanarth Street station, at Newport, have recently been carried out, of which the following particulars may be of interest. At the present time there is a single-phase supply at 2,000 volts, 87·5 periods, and the three-phase supply is at 6,000 volts 50 periods; the former is part of the original scheme put down in 1895, and consists for the most part of H.T. feeders with transformers on consumers' premises, which it is hoped at an early date to rearrange with a view to coupling it to the three-phase supply.

By careful rearrangement of the plant, room was made to install a 3,000-kw. turbo-alternator together with all its auxiliaries, the order being placed with A.E.G., which guaranteed early delivery.

The new turbo-alternator generates three-phase current at 6,000 volts, 50 periods, running at 3,000 r.p.m. The development of these high-speed sets for medium outputs has been carried out without sacrificing reliability of operation in any way; the rotating parts of the turbo-generators were subjected to a 50 per cent. excess speed test for half an hour with perfectly satisfactory results.

The turbine is of the Curtis horizontal type, with automatic governing at all loads and electric speed control from the switch galleries; it has only three bearings. The automatic nozzle regulation has the effect of securing the highest economy over a very wide range of load; the opening

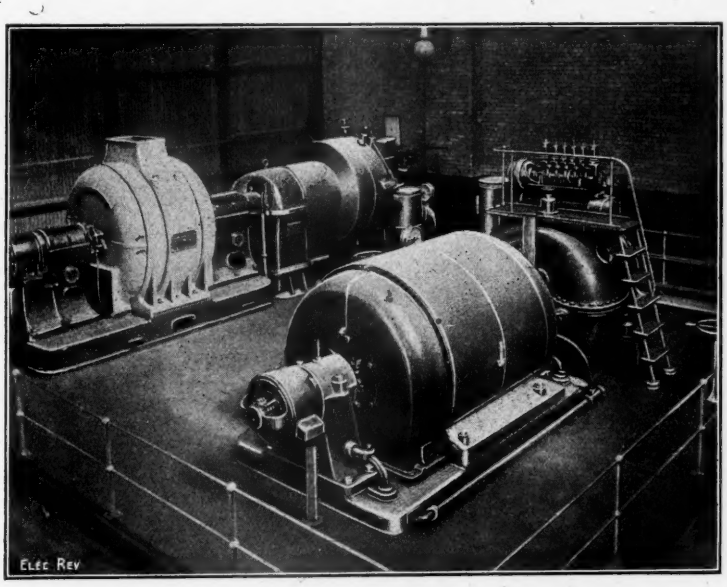


Fig. 1.—New 3,000-kw. Turbo-alternator, with 1,500-kw. Set in Background.

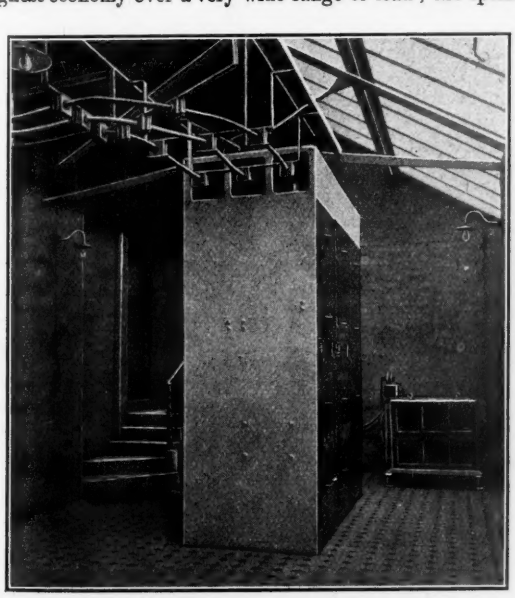


Fig. 2.—E.H.T. Switch-house, Motor-driven Rheostat, &c., Newport.

of the nozzles is effected by means of oil pressure supplied through a relay valve under the control of the main governor, which is driven direct off the main shaft. The excellent regulation of the set is one of its most interesting features, and even on rapidly varying traction loads practically no variation in voltage occurs.

The alternator is of the maker's usual type, and is coupled direct to the turbine by a rigid coupling; the exciter is at the outer end, coupled direct to the main shaft, and has no outboard bearing. Ventilation is provided by means of powerful fans fixed at either end of the rotor, the hot air being discharged down through the centre into the outgoing air ducts. The maximum load obtained under test was 4,113 kw. for one hour, and even at this load the temperature rise was much below the guaranteed figure.

The steam consumption ascertained at the official tests on site came out slightly below the guaranteed figures; the flatness of the steam consumption curve between $\frac{3}{4}$ load and 25 per cent. overload is shown in fig. 6. The figures given are those obtained after all corrections have been made for steam pressure, superheat and cooling water temperature, the guarantee being based on cooling water temperature and not on vacuum. As the superheat temperature was only 100° F., and the steam pressure at the stop valve 162 lb. per sq. in., the consumptions are very satisfactory.

Before the new plant could be installed an existing 300 kw. set had to be removed to another position in the power house, for which foundations had first to be provided, and then its existing foundations removed to make room for the foundations of the new plant; the latter consist of two main blocks resting on a concrete raft 6 ft. deep. These main blocks are laced together by a large number of 24-in. and 20-in. girders of heavy section, these again being laced together by cross girders riveted and bolted in position.

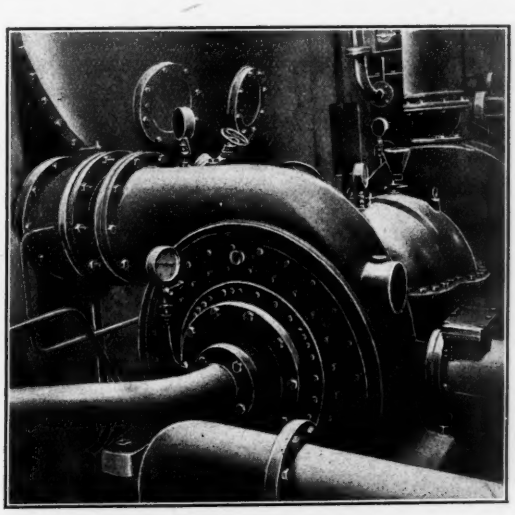


Fig. 3.—Turbine-driven Circulating, Air and Force Pumps.

There is no actual physical junction with the existing foundations of the 1,500-kw. turbo-alternator foundations nor with the foundations of the adjacent 500-kw. cross

compound reciprocating set. The approximate total weight of concrete in the new foundations is 300 tons and the total weight of the girders used, 12 tons. The whole of the foundation work was carried out by the Corporation staff.

A 72-in. exhaust valve connects the main turbine exhaust and the condenser below. Beyond the condenser body at the alternator end is placed the air chamber, from which is drawn the cooling air for the alternator. A small turbine,

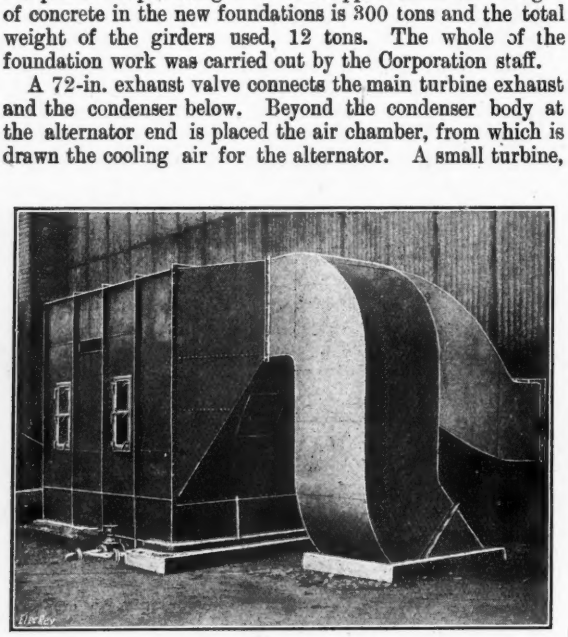


Fig. 4.—Wet-Air Filter Plant, Newport.

running at 1,500 R.P.M., drives direct the circulating and air pumps, the pumping set being placed on one bed plate. The necessary diffuser tank, &c., is sunk in the concrete raft of the foundations. The force pump is combined with the air pump, and lifts the condensate to a height of 53 ft. to the feed tanks, which are situated on the boiler house roof.

In connection with the steam-driven condensing plant is an automatic change-over valve, designed to overcome the

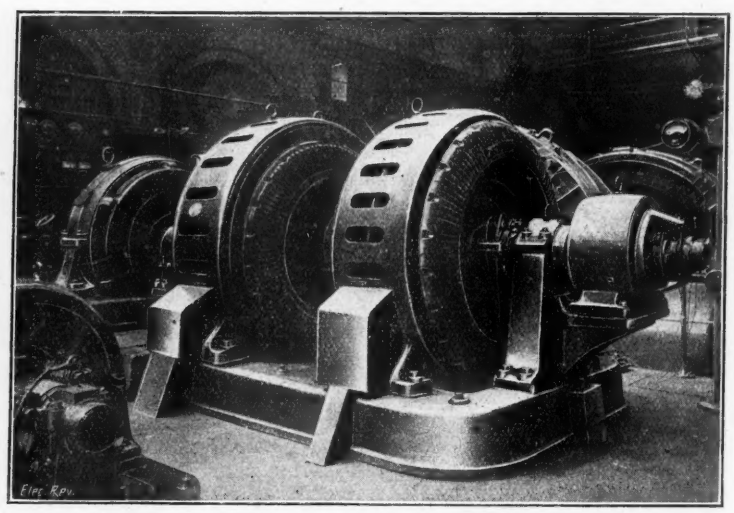


Fig. 5.—600-kw. A.C.-D.C. Motor Generator.

difficulty of controlling the speed of the main turbine at low loads. Formerly the exhaust from the auxiliary turbine was admitted to the main turbine through a quick closing stop valve, mechanically coupled to the automatic emergency gear on the main stop valve; with this arrangement the exhaust steam from the auxiliary turbine was not under the control of the governor in any way, and at low loads often gave rise to hunting, and might have become a source of danger to the main turbine in the event of the load being suddenly thrown off. The automatic change-over valve is placed in the exhaust pipe between the auxiliary turbine and the main turbine, and is provided with a connection to the condenser. The valve is controlled by the pressure which exists in the main turbine casing, and is so arranged that on a pre-determined fall of pressure taking place the exhaust steam of the auxiliary turbine is cut off from the main turbine and passed into the condenser, saving the condensate.

A well gives a full view of the condensing plant from the engine-room galleries, and the arrangement is such that one man can easily look after the entire plant.

A small auxiliary steam turbine-driven oil pump is provided for circulating the oil when first putting the turbine on load until the main turbine pump takes up the load. The water supplying the oil coolers is drawn from

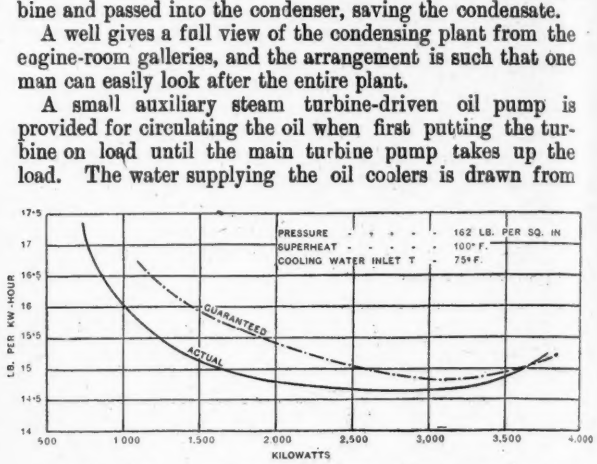


Fig. 6.—Steam Consumption Curves, 3,000-kw. Turbine, Newport.

the circulating water inlet, the town supply only being kept as a stand-by.

A large number of special recording instruments of the Fournier type have been installed and there is a special indicating alarm thermometer fixed to the oil supply which operates as soon as the oil temperature reaches a predetermined maximum.

The switchgear for the 3,000-kw. turbo-alternator is installed in stoneware cubicles erected in a fireproof switch-house which has been put up as an annexe to the main switch galleries. The extra high-tension switchgear was supplied by Messrs. Bertram Thomas; the transformers are isolated and the oil switches are of B.T.H. solenoid type and have a rupturing capacity of 20,000 kw.

The switchgear for the existing 1,500-kw. turbo-alternator has also been modernised, and a complete duplicate gear has been erected interchangeable with the 3,000-kw. switchgear, the oil switch being of the same capacity as for the 3,000-kw. machine. The switchgear is operated from the gallery by means of a low-tension control panel, B.T.H. push-button switches being used. In the switchroom has also been installed the main field rheostat for the alternator, operated from the control panel by means of a small motor fixed above the rheostat, the starting switch for the same being placed on the control panel. Indicating lamps are arranged, and as the contact arm of the rheostat travels over the stops, alternate red and green lights show the attendant the number of stops it has travelled over.

A Sturtevant wet-air filter has been installed of 30,000 cb. ft. capacity.

The other extension consisted of a 600-kw. d.c. generator, manufactured by the Lancashire Dynamo and Motor Co., Ltd., which has been coupled to an existing 700-kw. three-phase to single-phase motor-generator. The latter machine was lightly loaded for a greater portion of the year during the daytime, and in order to provide additional load for the turbo-alternator, and make it possible to shut down some of the old plant, it was decided to install a new machine, so that during the daytime the 700-kw. three-phase motor driving the 600-kw. d.c. generator provided energy for d.c. lighting and power purposes. As the single-phase load increases towards the evening some of the d.c. load is eased off and the single-phase load taken up as required. Although somewhat unusual, the arrangement has fully justified itself. No direct connection is provided between the existing bed-plate and the new bed-plate of the 600-kw.

generator, and the machines are coupled together with a Zodel-Voith coupling of ample design. On test the temperature rises were below guarantees, with absolutely sparkless running. The peripheral speed of the commutator is high, the revolutions being 750 per minute.

It has been so arranged that the machine can, if necessary, run as a motor driving the three-phase to single-phase motor-generator, so that it is possible to obtain a single-phase supply from the D.C. or alternatively to provide a three-phase E.H.T. supply to the main bus-bars.

The rapidity with which the extensions were carried out reflects considerable credit on the Newport staff; the official order for the new plant had hardly been given before the existing 1,500-KW. alternator burnt out, thus depriving the department of a three-phase supply. The re-winding occupied several months owing to unforeseen delays, but notwithstanding this the plant was completed and officially

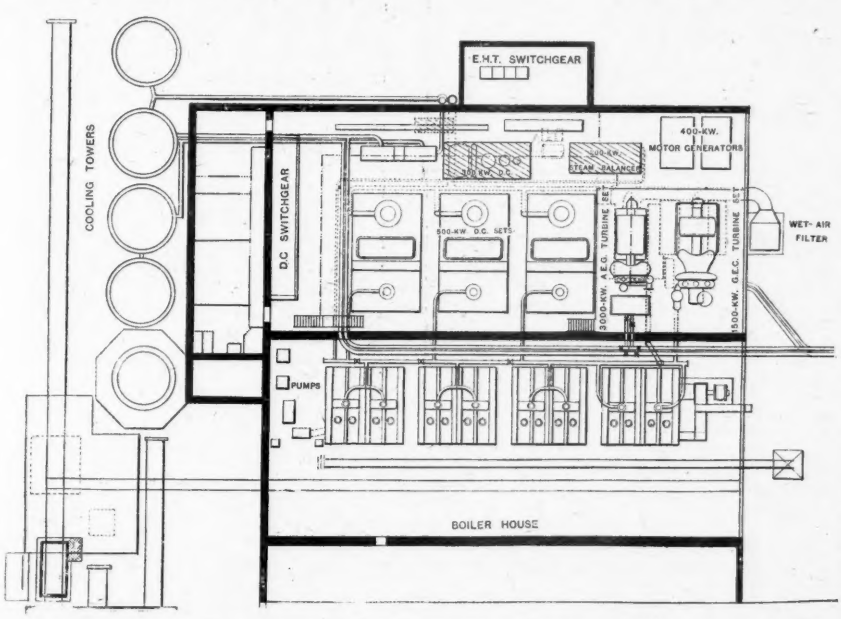


Fig. 7.—Plan of Works, Showing the Relative Space Occupied by the Plant.

placed in operation on December 17th, being a total of 169 working days. The official tests were carried out in the latter part of May, and the plant was taken over by the Corporation from the date of the tests.

We understand from Mr. Nichols Moore, the borough electrical engineer, to whom we are indebted for the foregoing particulars, that the capital cost per KW. installed, including foundations and switchgear, is £1 17s. 6d. per KW., and, including condensing plant, new building works, &c., the total figure is £2 15s. 6d.

THE "ZIG" LIGHTNING AND SURGE ARRESTER.

A NEW type of arrester, patented by Messrs. Pizzuti and Ferrari and manufactured by Messrs. Vedovelli, Priestley and Co., Paris, is being placed on the English market by Messrs. Laing, Wharton, Ltd. For the Zig arrester it is claimed that the principles involved in its design are such that surges will be discharged with certainty through the arrester to earth.

It is well known that in electrical installations, dangerous excess voltages may arise either from induction, due to atmospheric conditions, or from sudden load variations or due to resonance effects.

Arresters arranged to protect an installation are useless if situated in the neighbourhood of the nodal point of the pressure wave. To remedy this, Messrs. Pizzuti & Ferrari have introduced the Zig arrester, which has been designed from consideration of the laws by which oscillating disturbances are propagated in circuits.

The speed of an oscillatory wave along a circuit may be stated as $\sqrt{\frac{1}{C\,L}}$ where C and L are the capacity and inductance of the conductor respectively.

If the natural impedance has a constant value at every point of the line, the wave is propagated without deformation or appreciable alteration. When the wave arrives at a point after which a fall of impedance occurs, a partial reflection with change of sign and fall of potential takes place; the current phenomena are, however, the reverse of those for potential.

If, on the other hand, the wave arrives at a point where a rise of impedance occurs, a partial reflection without change of sign and a rise of potential takes place, the current phenomena being again the reverse of potential phenomena.

The rise or fall of potential is greater, the greater the variation of the natural impedance of the line. If the natural impedance of the circuit passes from a very small value to a very high one in consecutive sections, there occurs at the junction a total reflection of the wave.

The potential, however, does not change sign at the reflection, but the current changes sign and thus a nodal point is formed.

The contrary takes place in the case of passing from a very high natural impedance to a very low one. As, with aerial lines, the product of C and L has a nearly constant value, and the surges have a frequency of the order of 10^4 to 10^5, corresponding to a wave length of between ·3 and 3 km., it is sufficient to give to the protective apparatus a capacity and inductance equivalent to 1·5 km. of the line.

If an apparatus is inserted in series in the line, whose capacity and self-induction is equal to that of the part of the line between two successive nodes, all the values of the potential wave are distributed in the apparatus, and any surges will be discharged to earth if suitable arresters are installed. The Zig arrester shown diagrammatically in fig. 1 consists essentially of a capacity A B, one part of which is connected to earth, while the other is in series with the line and a self-induction B C.

A B has a very small natural impedance, and B C a very large one; a surge passing along the transmission line is partially reflected at A, and totally at B, and at this point the pressure rises above that of the line in consequence of the variation of impedance.

If a discharge path is provided at B the protection of the system is assured; the energy of the surge wave will dis-

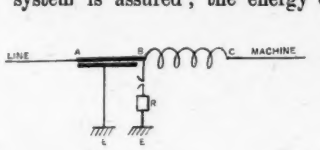


Fig. 1.

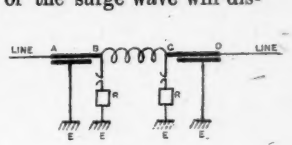


Fig. 2.

charge not only through the lightning arrester at B, but also through the dielectric of the capacity A B.

A B and B C are so proportioned that the time taken by the reflected wave to pass from B to C is equal to or greater than that required by the wave to pass from B to A, so that before the reflected part of the wave arrives at C, it is discharged by the arrester at B, the excess voltage having already attained its maximum at B.

In order to facilitate the discharge several arresters are placed in parallel, and these are connected to earth through a resistance in the usual way.

To protect an installation on both sides the arrangement

shown in fig. 2 is adopted, being a further development of fig. 1.

This method is reported to be very effective, not only for very high-frequency disturbances, but also for those of lower value such as might arise from the rapid breaking of a circuit; it can be applied to protect underground cables from surges.

The Zig arrester has been successfully employed in many important Italian installations, and is constructed in four types—for 12,000, 30,000, 50,000 and 90,000 volts.

Fig. 3.—Installation of 90,000-volt Zig Arresters at Sescara.

It may be mentioned that amongst the installations in use, the Società Meridionale di Elettricità has applied them to its 30,000-volt transmissions, and is fitting them to its 90,000-volt lines.

THE ELECTRICAL TRADES AND THE WAR.

"Business as Usual"!

That the outbreak of war between seven European nations must necessarily exercise an immense effect upon British trade and industry is an obvious truism; our relations with our neighbours are so intimate and intricate, that even a strictly localised conflict must influence our commerce to an appreciable extent—how much more, then, a conflagration which has enveloped the Continent from end to end, and has already caused minor eruptions to flame forth in Africa, the Mediterranean and the Far East! The circumstances are utterly unprecedented in the world's history, and no man can foresee the outcome of the gigantic struggle, though we all in this country confidently look forward to the liberation of Europe from the burden of armaments which has been imposed upon it for nearly half a century by the overweening ambition and brutal arrogance of one nation, or rather of the military leaders of that nation, upon whose shoulders the consensus of opinion throughout the world lays the burden of responsibility for the frightful catastrophe which for the time has overwhelmed the Continent.

The closing of the Stock Exchange in itself was convincing evidence that a crisis of unexampled gravity had developed, for never before had so drastic a step been found necessary; to this was added the raising of the Bank Rate to 10 per cent., and the closing of the banks throughout the United Kingdom for three extra days, together with the issue of a moratorium permitting the postponement of payment of debts above £5 for a period of one month, and the issue of Government notes for £1 to take the place of gold in the national currency. All these factors combined to arouse anxiety in the minds of manufacturing and trading concerns of every description, as to the probable course of events in the immediate future, and the possible necessity of adopting special methods of transacting business under the changed circumstances. From information and inquiries which we received, we judged it advisable to ascertain as quickly as possible the views of leading men in the electrical industries with regard to the situation, and though our inquiries in the short time available naturally have not been exhaustive, we find the replies so closely in harmony with one another that we feel justified in concluding that the opinions held by the leaders are practically unanimous, and that they may safely be put forward in a summarised form for the information of our readers generally.

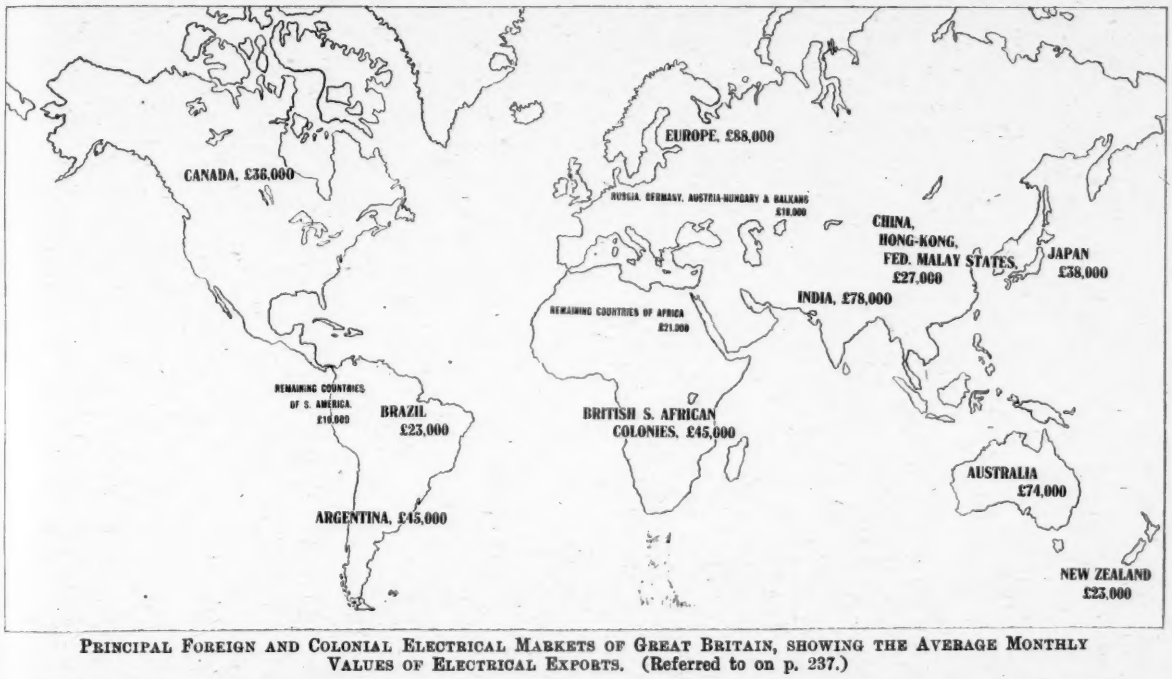
First we may refer to the profound relief and satisfaction everywhere felt with regard to the admirable manner in which the Government and the banking interests have grappled with and mastered a situation of unique difficulty and danger. The reopening of the banks on Friday last was awaited with anxiety and even trepidation; no one knew what to expect, and the crisis in men's minds was at this moment acute. Happily, however, what might have been Black Friday indeed passed off with a calmness and lack of incident which can only be described as astonishing. Instead of heavy withdrawals from the banks, gold was actually paid in in considerable amounts, and even the new £1 notes were hardly to be seen; in point of fact, in some cases it was difficult to obtain them instead of gold. We must pay a tribute of admiration to the banks for their peculiarly sagacious action with regard to the cashing of cheques for wages, so many of which were presented in the normal course at the week-end; these were cashed in gold, silver and £5 notes, the new £1 notes being withheld because their strange aspect—and certainly they have not the superficial but convincing qualities of appearance and crisp substance that characterise the £5 note—might excite the suspicion of the working men, and lead to trouble. As one gentleman remarked to us, they looked more like I O U's than bank notes, and the unsophisticated workman might well look askance at these substitutes for golden sovereigns at first sight. But now that all fear of a financial panic is removed, there should be little, if any, difficulty in introducing them for general use. That their appearance can be improved is admitted, and the ambiguous statement which each bears that it is "legal tender for any amount" will no doubt be rectified. The great fact remains that British finance rose to the occasion, and the national credit has passed through this most trying ordeal with triumphant success. That financial resources constitute perhaps the most powerful weapon in warfare is axiomatic, and we hope that the magnificent success that we have already scored in this field will be followed by no less striking victories on land and sea.

The next question regarding which we made inquiries was the probable effect of the moratorium upon the course of business. And this is bound up with a question of perhaps still greater importance—the circulation of money. Obviously, if a large purchaser delays payment for goods supplied, the manufacturer's working capital is reduced to that extent; the latter cannot order raw material or pay wages with freedom, lest he should run short of capital, and he is unable to accept contracts which would keep his men employed even when they are offered. The purchasing power of the workmen is thus curtailed, and the inevitable tendency is towards the cessation of trade and industry, the starvation of the poorer classes and national bankruptcy, involving the ruin of the selfish purchaser himself. It is of the very utmost importance, therefore, that goods shall be paid for promptly at the accustomed dates, and that the relief permitted by the moratorium shall be availed of only when absolutely necessary. In this connection, we venture to appeal to all muni-

cipalities and other great purchasing corporations scrupulously to avoid delay in payment for work done, and even to anticipate the usual date when possible, in order to assist in the free and unfettered circulation of money and the maintenance of full employment throughout our industries. By so doing they will be performing a patriotic service of the greatest value to the State, and, incidentally, will be serving their own interests to the best advantage, for it is infinitely better to keep men employed on useful and productive occupations than to feed them when they have been thrown out of employment for want of work. The importance of this question is so great that we may even regard it as the key to our position, which, if adequately safeguarded, will render our defences impregnable, our credit unassailable, and our prosperity now and after the war a certainty.

Our attention has been pointedly drawn to this matter by the fact that a few firms—hardly any electrical firms—in headlong haste, have issued circulars broadcast to their clients, stating that in future they must have "cash with order." We cannot refrain from characterising this as an unpatriotic action deserving of the strongest condemnation, and calculated, if widely imitated, to bring about that very disaster which we all desire, and are determined, to avoid. We are glad to say that we know of very few instances in which this payment of dividends at the customary dates is another matter to which attention may be directed. In a few cases industrial companies have refrained from distributing their profits, a measure of precaution which may prove disastrous to some of their shareholders.

Next let us refer to the important question of transportation facilities by land and sea. The railways of the United Kingdom are now amalgamated into one great national system under the control of the Government, and the rolling stock of the railway companies has been used in accordance with the requirements of the moment for the purposes of mobilisation, without regard to ownership, so that no doubt it has become considerably mixed. This, however, is of small consequence; the trucks at any rate are still within our borders, and though some delays may occur during the next few weeks, the railway companies, whose organisation is intact and highly efficient, can be trusted to restore normal conditions at the earliest possible moment after the completion of the mobilisation. As regards transport by sea, there is no doubt some temporary uncertainty, and this will obtain until the British Admiralty is in a position to declare all seas safe for our ships. Already, however, the rates for war insurance are at a more moderate figure, and apart from the



PRINCIPAL FOREIGN AND COLONIAL ELECTRICAL MARKETS OF GREAT BRITAIN, SHOWING THE AVERAGE MONTHLY VALUES OF ELECTRICAL EXPORTS. (Referred to on p. 237.)

course was followed, and we trust that the firms in question, on reflection, will perceive the dangers with which it is associated, and will lose no time in cancelling the circulars, which, we may add, were addressed indiscriminately to firms of the highest standing, as well as to those which may not be so substantial as to justify extended credit under the existing conditions.

It will be agreed that it is highly desirable that no departure shall be made from the usual practice with regard to credit accounts, unless circumstances arise which render it absolutely unavoidable. And there is no evidence at present that such circumstances will arise. They can only arise through the locking-up of funds to which we have referred, and, if money is kept in circulation, this will be avoided.

We are pleased to be able to record the fact that on Friday last the Council of the British Electrical and Allied Manufacturers' Association communicated with its members pointing out that prices should not be unduly inflated, and that care should be taken to avoid creating alarm; on the contrary, the Council expressed the earnest hope that the members would refrain from any changes in prices or business terms which might give rise to uneasiness. These views we cordially endorse, and we may add that, without a single exception, the replies that we have received from electrical manufacturing firms in London and the provinces indicate that no changes are contemplated. The North Sea traffic, which is at present restricted, there is little to fear on this score. In passing, we may remark that war insurance on sea-borne goods is somewhat peculiar, in that it is properly chargeable to the purchaser, even when goods are shipped c.i.f. It is the purchaser's business, therefore, to attend to this matter under the existing conditions. The risk, presumably, is measured by the rate of premium charged, which indicates that for the present it is advisable to avoid shipping large and valuable consignments abroad; but we confidently anticipate relief from this restriction within the next few weeks. The question of the importation of raw material is, perhaps, at the moment of greater significance than that of exportation of manufactured goods, for there are certain materials such as copper, lead, rubber, &c., of which an adequate supply cannot be obtained from our internal resources. Without raw materials it is obviously impossible to produce the goods, and for this reason the restoration of normal shipping conditions will be anxiously awaited. We are glad to be able to state, however, that some, at any rate, of our manufacturers have laid in large stocks which will enable them to continue in full swing for many months. One of the unexpected disclosures effected by the outbreak of war is the extent to which reliance has been placed by British manufacturers upon supplies of raw material from Germany, as evidenced by the number who have had to close their works for want of it. We trust

that the outcome will be the transference of the bulk of this trade to British producers of "raw material" such as iron and steel, &c.

With the exception of the firms last mentioned, which will doubtless take steps to supply their needs from home sources, the intention is invariably expressed of carrying on the works at full swing, and keeping in employment as many men as possible. Should it become inevitable that output must be reduced, the unanimous resolve is to work short time rather than to dismiss a single workman—a patriotic policy which cannot be too heartily approved. The proportion of Reservists and Territorials called up to the colours ranges from 5 to 10 per cent. of the employés, so that there should be no difficulty in producing the usual output, with a small amount of overtime if necessary. Vacancies in the staff will not be filled; the duties of those who are away on service will be discharged by their colleagues, and the families of the former will receive generous treatment, being paid in some cases the full salaries. Workmen called up will similarly be paid, at rates varying from 10s. a week to half their usual wages, and if their places are filled by others, they will be reinstated on their return. Further, many firms express the intention of "looking after" the families of the absent men, not merely paying them. We are happy and proud to be able to make these statements, and to express our admiration of the patriotism which we meet with on all hands.

With regard to the disposal of the output of the works, the intention of all whose products are suitable for Government use is to place them unreservedly at the disposal of the military and naval authorities, and to exert every effort to cope with the demand for such supplies. Immediately after the outbreak of hostilities, the Council of the B.E.A.M.A., on behalf of the members, wrote to the Admiralty and War Office offering to use every endeavour towards expediting Government contracts. The Council had no doubt that their action would meet with the hearty support and approval of every member of the Association. We could say more upon this subject, but it is not advisable, in the national interests, to particularise at this stage. After the needs of the Government have been satisfied, old customers will be given the preference over new ones. There is in this connection evidence of the existence of a grievance, not a bitter feeling but a very real one, against British manufacturers and contractors who in the past have gone abroad for goods and material which they could have obtained at home. It is said that there is no sentiment in business; sometimes there is not, but as a general statement the saying is not true.

Solicitude is everywhere expressed for the position of small firms, which may not be possessed of adequate means for prompt settlement of their accounts, especially those which deal with the general public and may sometimes be obliged to give long credit. The large manufacturing firms are prepared to treat them with the greatest consideration, and to avoid applying pressure to them, even where in normal times this would be regarded as justified.

It is gratifying to record that it is reported in many quarters that orders and payments are coming in just as usual, with the exception, of course, of those that are interfered with by the abnormal conditions affecting transport by sea. Some of our informants have expressed a wish to remain anonymous, evidently having no desire to advertise their patriotism, or to make capital out of the war, and we have thought it well, therefore, throughout this article to refrain from mentioning any firm by name; but we may quote from a few of the letters that we have received as samples of the whole:—

With reference to your letter of the 7th inst., we are carrying on our business just as usual, and shall continue to do so to the best of our ability. We have the assurance of our suppliers that unless conditions alter for the worse very materially, they will be able to keep us going. The chief fear we have is that purchasers of our manufactured articles may refuse to take delivery, thus causing great inconvenience and congestion in the works. So far as the men are concerned, we are keeping everybody's place open, and making provision for the dependants of those who are called up or volunteer. We would prefer that our name does not appear.

One result of the war strikes us very forcibly. We have this week been inundated with orders for small meters and also for large meters from entirely new customers, and we can make out quite an elaborate list of patriotic electrical engineers who support home industries. It has also opened our eyes to the number of manufacturers from whom we are obtaining our raw material who, owing to communications with the Continent having been broken off, cannot now supply material. If the man in the street only had all this information we feel sure that he would support tariff reform in some form or other.

We beg to acknowledge receipt of yours of the 7th inst. with regard to the conditions now obtaining in the electrical trades. We quite agree that it is important to limit the disturbance as much as possible, and we shall do all we can to keep our workpeople employed. Up to the present we have not felt any very special dislocation, and we believe that if the trade generally continue to carry out their business as nearly as possible under normal conditions, things will not be quite as bad as they appeared likely to be. We anticipate accepting orders as usual, and on the usual terms of payment.

In reply to your inquiry as to the probable effect of the war on our trade, we beg to say that we are continuing business as usual—accepting orders at our usual prices and at usual terms of payment—and that it is our intention to do so until circumstances arise that may oblige us to make any change. The volume of orders on hand is normal and the works are running full time. There has been no reduction in the customary flow of orders or inquiries. We do not depend upon the Continent for the supply of any of the material or parts of our manufactures (alternating current motors and accessories), and are not, therefore, we believe, likely to be held up for want of material. We anticipate that though in some trades slackness is bound to ensue, there will be unusual activity in others to supply the requirements of the Army and Navy; and foreign imports being restricted we consider it probable that our works will be kept fully employed. Should it, however, become necessary, we should work short time rather than dismiss workmen. With regard to Reservists in our employ, the dependants of those who are called up will be looked after—as they have been in the past—and the Reservists themselves will be taken on again on their return.

As for the future, we deal with this in our leading columns; but we may here express the view that, taking it for granted that the war will result in the overthrow of the German naval and military power, as we all hope and believe, the cut-throat competition from which our manufacturers have suffered in the past will be removed, the exploitation of the British Dominions and Colonies (of which the Rand is so conspicuous an example) will cease, and a large volume of foreign trade will be diverted from the Continent to our workshops. Thanks to the mad policy which has been followed by the German Government, the sympathy of the whole world has been alienated, and Germany stands almost without a friend but Austria. As we urged in our leader last week, the prime essential at the moment is to obey the call of duty, which comes to every one of us; then we need not fear the result. Our manufacturers have patriotically obeyed the call, and, as one correspondent says, "business will go on as usual." That is, in a nutshell, the watchword of victory.

WIRELESS TELEPHONY IN RAILWAY OPERATION.

By H. A. TINSON.

Severe snow and wind storms prevailed in the eastern portion of the United States during February last. The telegraph and telephone systems of all the railroads running to New York were practically demoralized. This state of affairs lasted in some sections of the country for more than a week, and it was on that occasion that the officials of the Delaware, Lackawanna and Western Railroad had the opportunity of demonstrating the practical utility of the Marconi system of wireless telegraphy in the operation of their trains. The installation was described in our issue of March 20th, 1914.

Since that time Mr. L. B. Foley, Superintendent of Telegraphs for the Delaware, Lackawanna and Western Railroad, has been investigating the further possibilities of utilizing wireless telegraphy and telephony for keeping in communication with moving trains.

Recent investigations in this field have resulted in a successful demonstration of wireless telephony between the Company's station at Scranton, Pa., and moving trains. With Marconi telegraph transmitters, communication has been maintained from a passenger train up to a distance of 60 miles, and up to 207 miles from a track side station to a train.

The system now being investigated and tried out

by the Lackawanna Railroad is that devised by Dr. Lee de Forest. The installation at Scranton was put in by the Radio Telephone and Telegraph Company of New York, and it has been possible to maintain clear voice transmission with a fast-moving train at any point between Stroudsburg, Pa., and Binghamton, N.Y., a distance of 120 miles.

The installation at Scranton consists of a generating set of about 1 kw. capacity, the frequency being approximately 3,000 cycles per second. The antenna is 300 feet in length, and at an elevation of 150 feet above the ground. A quenched spark is used with the transmitter.

Dr. Lee de Forest first used an oscillator with two metal electrodes having a water jet playing between them. He obtained a quenched spark effect which proved very efficient as a generator of high-frequency current. The negative electrode of this form

DE FOREST RAILWAY WIRELESS TELEPHONE OUTFIT.

of oscillator consists of a small copper disc about six inches in diameter, which is made to rotate. The positive electrode is made up of a copper tube or quill rotating about an axis placed at right angles to the axis of the negative electrode disc. The arc length is about .02 inch, the water jet playing directly upon the parts of contact.

In shunt around the electrodes is connected an oscillating circuit, including a condenser and inductance. The inductance is loosely coupled to the inductance of the antenna and the oscillator is used with or without a magnetic field. The de Forest transmitter, it is said, requires no adjustments when once tuned and set for a definite wave length. No attention is required on the part of the user, other than throwing a switch from transmitting to receiving, or *vice versa*.

The antennae on the trains extend over four cars. The generator on the train is directly connected to a small steam turbine in the baggage car, supplied from the steam heating pipes beneath the car.

A detector styled the "audion" is used with this system. Train noises render it imperative to use an amplifier and a detector on the train. A two-step amplifier, giving from 50 to 60 amplifications, is used.

The officials of the D.L. and W.R.R. system, it is understood, intend to make wireless telephone installations a part of their permanent equipment on the two trains used for their "Lackawanna Limited" service.

Messages will be handled at a fixed rate, the same as with the telegraph, but they will be telephoned by a regular member of the train crew.

Apart from the experiments described above, the Radio Telephone Company states that it is now telephoning from Scranton to Binghamton over the D.L. and W.R.R. using about ¼ kw. from a 3,000-cycle alternating generator, with special quenched spark. This transmitter is found much more efficient and effective than any arc system, and requires no attention on the part of the speaker except to throw the switch from transmitting to listening. The company expects to have the system installed on certain trains of the D.L. and W.R.R. very soon, and hopes with apparatus of 5 kw. to telephone 500 miles over land under favourable conditions, with the audion at the receiving end, but without amplification.

THE RUNNING AND MAINTENANCE COSTS OF ELECTRICAL MOTOR FIRE ENGINES.

Some interesting details of the motor equipment of the Berlin Fire Brigade, and its running and maintenance costs, are given in the report recently issued by the Chief of the Brigade for the year ending March 31st last. The equipment at present consists of twelve sets or "trains" of electric machines, each set comprising a chemical fire engine, an electrically-propelled steam or petrol-operated motor pumping engine, a stores wagon, and an escape ladder, plus one vehicle used for practice purposes, there being, thus, altogether forty-nine electric machines. The number of petrol vehicles owned by the Brigade is twenty-five, these comprising eighteen cars for the Chief and principal officers, three pumping engines, one stores wagon, and three miscellaneous machines. Berlin has, thus, a total of seventy-four motor vehicles in its Fire Brigade, but requires another

THE BERLIN FIRE BRIGADE.

Record of the Running and Maintenance Costs of Eight Electrical Trains (each Train comprising a Chemical Fire Engine, a Pumping Engine, a Stores Wagon, and an Escape Ladder) from the date of being put in service to March 31st, 1914.

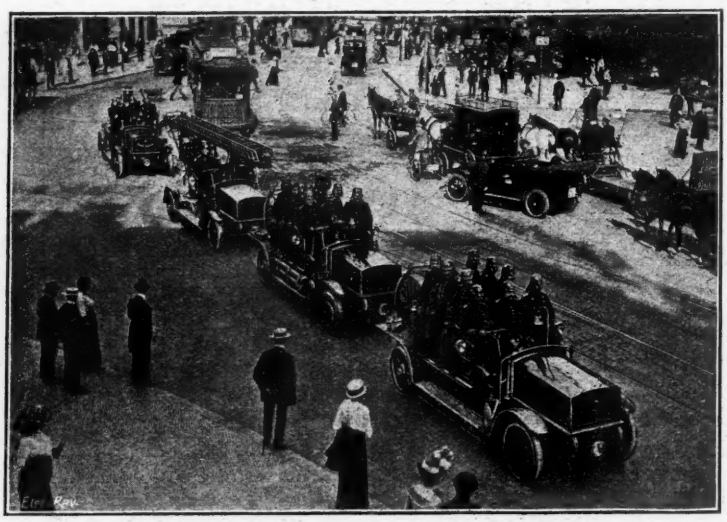
Train No.	In operation for	Cost of maintenance.				Running costs.			Total costs for period stated in second column.	Average annual cost.		Aver'ge time in hrs. per vehicle per year undergoing repairs, and consequently not available for service.	Miles covered since put in service.
		Chassis.	Body work.	Tires.	Non-skid bands.	Current.	Batteries.	Lubricants.		Per train.	Per vehicle.		
	Yrs. Mths.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.		
20	5 6	71 3	54 13*	122 13	263 10	337 19	662 18	3 14	1,516 10	275 14	68 18	16	12,730
15	4 5	92 4	12 19	78 13	232 18	308 18	520 5	2 13	1,248 10	282 13	70 13	14	11,317
19	4 2	64 8	14 4	96 5	266 10	315 12	499 10	2 11	1,259 0	302 3	75 0	16	12,347
23	3 10	117 1†	20 14	144 17	238 12	363 3‡	461 11	2 8	1,348 6	351 14	87 18	8	10,453
7	2 5	16 11	12 10	21 10	82 0	135 14	259 18	1 9	529 12	219 3	54 15	2	5,752
21	1 11	17 15	10 16	37 3	77 10	129 10	259 5	1 9	533 8	278 5	69 11	6	5,985
8	1 2	2 10	—	12 19	10 10	49 16	143 15	0 15	220 5	188 15	47 3	—	1,916
11	1 3	13 3	8 1	—	1 10	33 8	139 3	0 13	195 18	156 14	39 3	10	1,620
Total for 8 trains (32 vehicles).	24 8	394 15	133 17	514 0	1,173 0	1,674 0	2,946 5	15 12	6,851 9	277 15	69 8	15	62,120

* Includes repainting. † Due to faulty delivery. ‡ Extra cost of current due to transforming.

seventy-one to completely "motorise" its equipment.

It was as a result of exhaustive trials carried out in 1907, and in the early part of 1908, that the Berlin authorities decided to adopt electrically-propelled machines for city fires, and petrol vehicles for the transport officers, for suburban fires, and the transport of stores, and the report states that the decision then arrived at has proved itself to have been a wise one, owing to the rapidity with which the electrical vehicles can respond to a fire call. All the electric machines in service—the first one of which dates from September, 1908—were built by the Daimler Motoren Gesellschaft, of Marienfelde, Berlin, and are of what are known in this country as the Cedes type, the electric motors being enclosed in the hubs of the front or rear road wheels, which are thus driven direct without the intervention of any gearing. The motors—two per vehicle—are rated at 7½ h.p. each, and are able to propel the machines at a maximum speed of 22½ miles per hour. The necessary current is supplied by a battery of 84 accumulators of the capacity of 146 ampere-hours at a 5-hour discharge rate; one charge of the battery is capable of propelling the machine a distance of about 31 miles at a speed of 18¾ m.p.h.

In place of the electrically-propelled steam-operated pumping engine units of the trains that have until recently been employed, similar machines, but with pumps worked by petrol engines, are now being introduced into the service. The principal advantage of the new type of machine is a considerable reduction in the total weight to be transported, which has resulted not only in an extension of the radius capacity of the battery charge of this particular unit but also of the complete train.



BERLIN FIRE BRIGADE ELECTRIC VEHICLE TRAIN.

As regards the running and maintenance costs of the vehicles, a careful record has been kept, and the Chief has prepared a table—reproduced herewith—of the figures relating to eight of the "trains"—each comprising, as already mentioned, four vehicles which have been in service for not less than a year, the average length of service being 3 1-12 years.

Fire Brigade work is, of course, entirely of a special character, and the figures of costs shown, it will be readily understood, cannot be taken as the basis of any comparison or criterion of those of electrically-propelled vehicles for delivery purposes, where the quantity of goods to be dealt with, and the approximate daily mileage to be covered are known. The exact number of calls that the electric fire trains may be called upon to respond to in any one year is, of course, unascertainable, and only the average over a number of years can be taken as a guide. Last year, for example, the Berlin Brigade had to deal with a total of 14,854 fires, but whether the number be 14,854 or only 1,485, the vehicles have constantly to be in such a condition, both electrically and mechanically, that they are ready to answer a call at a few seconds notice. Hence, while the cost of maintenance of the electric fire trains may, in themselves, appear high, it can only be compared with that of the system it has displaced, and from the accompanying table it will be seen that the total annual costs work out at £277 15s. per train, or, approximately, £69 8s. per vehicle, these figures comparing with £1,095 13s. per train, and £273 18s. per vehicle, per year, in the case of horse-drawn machines. This means that four electric "trains" can be run at the same cost as a single horse-drawn train. Furthermore, it is expected that the cost of maintenance of the electrical vehicles will in future be lower, as arrangements have been completed whereby all repairs will be carried out in the workshops attached to the headquarters of the Fire Brigade, where, also, all spare parts will be made. It is, furthermore, hoped to effect an economy in the tire bill. It will be noticed that, so far, one of the most costly items has been that of non-skid bands. As a result of the experience that has been gained, it has, however, been discovered that better results, as regards freedom from skidding, are obtained with only two of the tires fitted with such bands—one at the front and one at the rear, arranged diagonally—than where three or four non-skids are used. A number of vehicles have also been provided with twin tires at the rear, and, in conjunction with these, one non-skid—on the front—has been found sufficient.

The cost of current is also considered high, and efforts are being made to secure a reduction in the rate charged, which, at present, is 1.8d. per kilowatt-hour. As for the batteries, it may be stated that these are maintained under contract at an annual charge of £23 15s. per battery, and that one spare set of accumulators is kept on hand for each train of four vehicles. As no signs of sulphating have occurred, and experiment is to be made in the way of entirely discharging and recharging the cells only once every two months instead of once a month as at present. An interesting feature of the table is the column which shows that the average time per vehicle per year devoted to repairs, or, in other words, the time that the vehicles were not available for response to a fire call, was 15 hours.

As regards the petrol vehicles belonging to the Berlin Brigade, the Chief reports that these have not been sufficiently long in service to give comparative figures. He remarks, however, that the cost of repairs has so far proved somewhat high, and that, correspondingly, the time the vehicles are not available for service is also high. Careful records are being kept of the petrol vehicles, and these will be published in due course.

In an early issue we hope to give some particulars of the electrically-propelled vehicles employed by the London Fire Brigade, and also some figures as to their running and maintenance costs, which will form an interesting complement to those given above for the Berlin Brigade.

German Wireless Station Destroyed.—A British cruiser has destroyed the German wireless station at Dar-es-Salam, in German East Africa.

THE EDISON & SWAN CO.'S NEW CITY SHOWROOM.

The accompanying view shows the interior of the Edison and Swan United Electric Light Co.'s new showroom in Queen Victoria Street. As mentioned in our note on page 185, the new premises extend through into Upper Thames Street, where the trade entrance is situated, and include stores, offices, and every facility for carrying on the firm's extensive business in electrical apparatus of all kinds. The new premises are centrally situated; the showroom, which measures some 83 ft. × 53 ft. by about 30 ft. in height, is on an imposing scale; side galleries give additional space, while the alcoves underneath them provide facilities for the display for smaller wall fittings, &c.

The arrangement of ceiling battens and supports allows of some hundreds of pendant fittings being on view, and a special feature is the provision for showing every fitting alight.

The decorations are in excellent taste, and the Ediswan emporium—it contains examples of practically everything turned out by the firm, which is saying a good deal—will be welcomed as a fitting addition to London's electrical rendezvous.

Readers should note that the new Victoria Street premises are now the firm's City headquarters, and that the well-known Queen Street and College Hill premises have been closed.

Showroom at the Edison & Swan Co.'s New City Depôt.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Electrical Trades Benevolent Institution.

At the present moment there must be a considerable number of firms whose staffs have been somewhat depleted by the calls on the Territorials and also the departure of foreigners to their countries.

As this Institution is now assisting four or five gentlemen who would be capable of occupying such positions for the time being, I shall be glad if, through your columns, you can induce firms requiring any of these to communicate with me.

This will have a double advantage: first, providing work for persons who are wanting it, and, secondly, enabling this Institution to husband its resources, a step which is more necessary than ever at the present time.

I may add that I regret to hear from one of those we have assisted in the shape of helping the man and his wife to set up lodgings, that owing to the war a German lodger who was sent to them by an electrical firm has had to go, and they are thus again placed in pecuniary difficulties. Their house is close to one of the South London tube stations.

F. B. O. Hawes,
Secretary.

18, Park Mansions, Vauxhall Park,
London, S.W., *August 6th*, 1914.

Engaging a Foreman.

Referring to your report in the issue of July 31st last of a case by our client, Mr. A. E. Short, against Messrs. Watson Marsh & Co., Ltd., of Brondesbury, we should like to point out that Mr. Marsh admitted in the witness-box he was so satisfied with our client's testimonials that he did not want to lose his services, and Mr. Marsh agreed to engage him with the prospect of an advance of salary in the following September.

The letter written by our client to the defendants only stated that nothing definite as to the increase of salary had been settled, and did not refer to the actual engagement at £2 10s. per week.

We trust that you will insert this letter in order that our client may make his position clear to your readers.

We might add that although the Judge decided against our client, he refused to give any costs to the defendants.

Armitage & Co.

London, N., *August 7th*, 1914.

Electrical Engineers and the War.

The suggestions made for the enrolment or registration of electrical engineers who are not members of any existing force are such as, no doubt, all will be in sympathy with, but I venture to suggest that it would be a mistake to multiply

such bodies, and that—at all events in the London district—a reserve to the Electrical Engineers Territorial force, under the control of that organisation, would be more useful. Further, the majority of those who would enrol themselves would, no doubt, be anxious not to be committed to be members of a body which would have no active duties, but would only be waiting to be called on, while their undertaking would prevent them from doing other work.

For example, those who, like the writer, own and drive cars, would probably be of service in that way, though, as electrical engineers, they would be more useful in electrical work if they could get anything to do. We all want to do something, however unimportant the work may be, but special knowledge should obviously be made use of if possible.

M.I.E.E.

Referring to my letter under the above heading which you kindly inserted in last week's issue, I should like to thank those gentlemen who have promptly offered their services, many of whom promise to assist in their respective districts, replies having reached me from all parts of the country.

All grades of electrical engineers are coming forward anxious to serve their country in the hour of need, and I hope others will follow, as it is numbers that tell, and skilled men in our profession play an important part in wartime. As soon as a sufficient number of signatures are forthcoming a Committee will be formed and prompt action taken.

In conclusion, I would state that it appears to me to be outside the scope of our Institution to take action, as the membership is very cosmopolitan.

W. Ellerd-Styles.

Leytonstone, N.E., *August 9th*, 1914.

[The Institution has already taken steps in the matter. Particulars will be found in our "Notes" columns.—Eds. Elec. Rev.]

End of the London Wiremen's Strike.

I have pleasure in notifying you that the strike of electrical wiremen in London, initiated by the Electrical Trades Union on April 1st, is now at an end, the members of the Union having been instructed to return to work.

The working rules issued by the London Electrical Masters' Association in March, 1914, have been adopted for a further six months, and a Joint Committee of masters and men will be appointed to adjudicate on any questions of hardship that may be brought forward.

I may add that these proposals were put forward by the masters in the early part of April, but were then refused by the Union.

Leonard G. Tate, *Hon. Secretary,*
London Electrical Masters' Association.

London, E.C., *August 10th*, 1914.

Mysterious Behaviour of a Generating Set.

I am employed at a fairly large colliery in South Yorkshire. We have a turbo-alternator, Willans turbo and Siemens generator (mixed pressure), running at 3,000 R.P.M., three-phase, 650 volts, 880 K.V.A., 750 KW. One day last week, when everything was running well, with about ¾-load on, it lost its excitation. (The exciter is direct-coupled, shunt-wound with interpoles, giving 110 volts, 105 amperes.) We stopped the turbo, examined round and could find nothing, so started up again, leaving everything as before, and she built up straight away with a reversed polarity, no connection being changed in any way. This week-end, however, we have tried changing the exciter connections. First of all we just changed the shunt, with no results. We put it back, and then changed the main brush connection, with the following results:—The exciter ammeter and A.C. voltmeter oscillated from half exciting current and half voltage back to zero; when the ammeter was going up the voltmeter would be going down. We then changed back again as before, and just changed the ammeter connections on the shunt. The ammeter then read in the right direction, but with a reading of maximum excitation current with no load.

J. Wood.

Darfield, *August 10th*, 1914.

The Protection of Engineering Works.

I shall be greatly obliged if you will make it known through the medium of your valuable journal that members of the Volunteer Civil Force are prepared to offer their services in any part of the country for the protection of engineering works and electrical power stations, &c. In view of certain possibilities, some satisfactory means of protection of private property should be found at once, and this we are prepared to do by sending trained men who have had experience in a similar direction.

Full particulars will be forwarded on application to Ruskin House, Rochester Row, Westminster, S.W.

W. R. Eustace.

London, S.W., *August 11th*, 1914.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Seachlights.

The London Electric Firm, of George Street, Croydon, have made a number of wheel-house type searchlights for a large Scotch shipbuilder, for use on passenger steamers, as shown in fig. 1. They are constructed of brass throughout, and are consequently very handsome machines. The size is 20 in., and they are fitted with high-grade silvered parabolic mirrors and diverging lenses, the voltage being 100. They have also introduced an entirely new type of searchlight for the use of fire brigades in

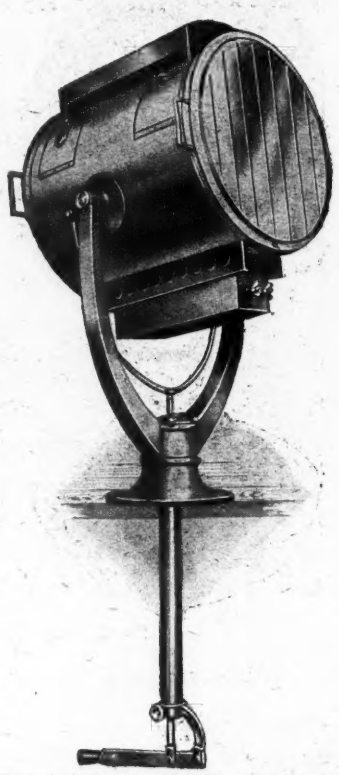


Fig. 1.—Wheel-house Searchlight.

illuminating shadow-cast exteriors and dark interiors of buildings. These are made extremely light, to enable them to be carried about easily, and very strong to stand the rough work inevitable with such service. The tripod collapses by means of sliding members, and also folds up, thus giving the maximum of advantage for transport purposes.

The machine gives a very widely-dispersed beam of light in all directions, and is also on the swivelling and tilting plan, giving a wide range of action. The candle-power is 3,000 at 100 volts, and current is supplied from a dynamo carried on the fire tender.

A "Witton" Traction Switchboard.

During the recent Convention of the I.M.E.A. in Birmingham, a visit was paid to the Witton Works of the General Electric Co., Ltd., where a large continuous-current switchboard which had just been constructed for the Cardiff Corporation was on view. This board consists of 25 panels and is over 45 ft. in length; it has been designed for controlling a supply for both lighting and

traction purposes. The panels themselves are constructed of fine white marble, and as will be seen from fig. 2, the board presents a very attractive appearance. An innovation for heavy-current switchboards has been embodied in the arrangements for the back

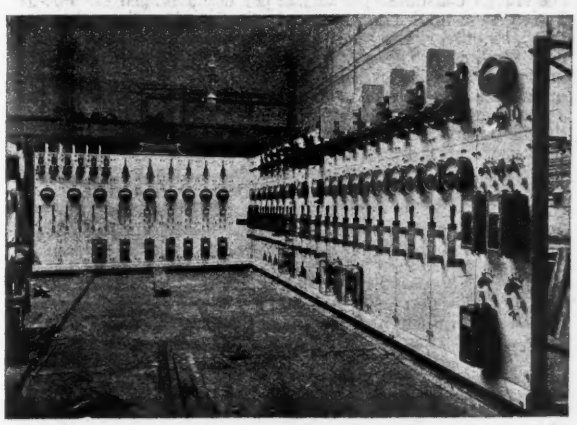


Fig. 2.—"Witton" Lighting and Traction Switchboard for Cardiff Corporation.

of the board. Instead of being carried from the usual brackets, the bus-bars are supported by the stems from the switches. These stems, therefore, serve both for a mechanical support and for the current carrying connection.

LEGAL.

Action Against the Tyneside Tramways Co.

At the North Shields County Court on the 6th inst., before Judge Greenwell, Eleanor Appleby, of Wallsend-on-Tyne, sued the Tyneside Tramways and Tramroads Co., to recover damages for personal injuries.

The allegation was that a car re-started while the plaintiff was dismounting from the car on February 2nd, and the plaintiff was thrown on to the curb, being rendered unconscious, and, as a result, was 14 weeks off work, and had not yet recovered.

Dr. Wilson, describing plaintiff's injuries, said it must have been a pretty hard blow that caused them.

The defence was that the plaintiff attempted to leave the car before it had stopped, and so received the injuries.

Judge Greenwell gave judgment for the Tramways Co.

A Compensation Case.

In a case heard at the Nottingham County Court the British L. M. Ericsson Co., Ltd., of Beeston, asked for the suspension of all compensation payable to Catherine Booth, tester of electrical apparatus, until the respondent had submitted to a simple operation to the middle finger of the right hand.

Judge Allen decided that compensation should cease until the operation was undergone, but the company then offered £75, without costs, in settlement of all liability, and the offer was accepted.

PHYSICAL SOCIETY OF LONDON.

At the meeting held on June 20th, at the Cavendish Laboratory, Cambridge, a paper entitled "Production of Very Soft Röntgen Radiation by the Impact of Positive and Slow Cathode Rays," was read by the President, Sir J. J. Thomson, O.M., F.R.S.

Röntgen and his pupils had always held that light waves were identical in nature with electrical waves produced by mechanical means, but there was a gap, on which very little work had been done, between the longest infra-red radiation and the shortest electrical wave that could be mechanically produced. He believed the investigation of this gap to be essential to the proper study of the constitution of the atom. The work already done on X-rays had demonstrated the existence of two separate rings of electrons in the atom, one within the other. These rings were responsible for the K and L types of radiation respectively. The L radiation was so much softer than the K that if a third ring of electrons existed, the radiation from which was proportionately softer than that of the L type, this radiation would fall well within the gap already mentioned.

In the first experiment described a special form of discharge tube was employed. The positive rays passed through a tubular perforation in the cathode and impinged obliquely on a metal target. A photographic plate of the Schumann type was situated at the further end of a branch tube in such a position that no solid obstacle interposed between the target and the plate. When the discharge passed between the electrodes, the photographic plate was affected. The application of an intense transverse electrostatic field between two metal plates situated between the cathode and the target completely stopped the effect, showing that this was not due to stray radiation reflected from the target, since, while charged particles would be swept to one side, radiation would not be affected by the field. Hence the passage of positive particles from the cathode to the target was essential. On the other hand, a strong transverse electrostatic field in the branch tube had no effect, showing that a radiation was passing betweeen the target and the plate, which was not, therefore, merely affected by positive particles rebounding down the side tube after impact on the target.

The properties of this radiation were intermediate between ordinary X-rays and Schumann waves. They were susceptible to reflection by metal surfaces, and their penetrating power was very small. They were completely stopped by the finest collodion film obtainable.

It was shown that the quality of the radiation did not depend on the energy of the moving particles which gave rise to it, but on the velocity. Hence equally soft rays should be produced by cathode particles if these were travelling as slowly as the positive rays. A discharge tube was constructed in which the cathode rays, leaving the cathode with the ordinary velocity, could be subjected to a retarding electrostatic field of variable strength before impinging on the target. In this way the velocity of impact could be varied over a large range, and radiations were obtained varying in quality from ordinary hard X-rays to the so-called Schumann waves. It was hoped by the study of these radiations to be able to determine not only the number of rings of electrons within the atom, but the number of electrons in each ring.

Sir Oliver Lodge expressed the opinion that the work just described was of far-reaching importance, and he felt confident that the results warranted the anticipation that further work would confirm the explanation foreshadowed by the President.

At the meeting held on June 26th, 1914, at the Imperial College of Science, a paper entitled "On Atmospheric Refraction and its Bearing on the Transmission of Electromagnetic Waves round the Earth's Surface," was read by Prof. J. A. Fleming.

In this paper the author considers the conditions under which true atmospheric refraction would be sufficient to carry a ray of light or electromagnetic radiation sent out horizontally from any point on the earth's surface round the earth parallel to its surface. It is now generally agreed that pure diffraction is insufficient to account for all the phenomena of long-distance wireless telegraphy, but that we have to postulate some action of the atmosphere which tends to curve the radiation round the earth. The theory of ionic refraction has been put forward, which is based on the theoretical conclusion that in ionised air the velocity of long electric waves is increased. We know as a matter of fact that the atmosphere decreases in density as we rise upwards, and this alone produces a decrease of refractive index and an increase in velocity.

The first part of the paper is concerned with the deduction of formulæ expressing this variation of density with height, taking into account as far as possible the known temperature variation with increase of height. It is shown that at a height of 100 km. the terrestrial atmosphere must consist substantially of hydrogen and helium. An expression is then obtained for the radius of curvature at any point of a ray of light sent out horizontally from the earth's surface, and it is shown that if the terrestrial atmosphere consisted wholly of krypton a ray sent out horizontally would be refracted round the earth, and in such an atmosphere wireless telegraphy to the Antipodes would be possible.

The question of atmospheric composition is then considered in the light of what is known about the auroral spectrum. The suggestion is made that perhaps the non-valent gases neon and krypton are manufactured at great atmospheric heights by electric discharges occurring in the rarified hydrogen atmosphere; also that by their ease of ionisation they contribute to produce the ionised layer demanded by the theories of Heaviside and Eccles to account for the actual achievements of long-distance wireless telegraphy.

Finally, it is suggested that our earth is perhaps unique in being the only planet on which such long-distance radiotelegraphy is possible.

Mr. Duddell considered it was very difficult to follow what was going on in long-distance transmission. One difficulty was that it seemed probable that the heavier gases were absent from the upper atmosphere, yet we had to assume their presence either to get the refraction effect or the Eccles effect.

Dr. C. Chree said that a fundamental point was whether the auroral spectrum did or did not connote a gas different from all hitherto isolated at the earth's surface. Wegener thought it did, and believed the unknown gas thus indicated to be a very light one, which at great heights was even more important than hydrogen. The fact that Prof. Störmer's recent photographic determination of auroral heights had in some cases supplied heights well over 300 km. was evidence that an atmosphere of some kind extended to a very great height. The fact emphasised by Dr. Fleming that wireless results by day and night differed markedly certainly seemed to support strongly his contention that the upper atmosphere played a most important part in the phenomenon. A similar conclusion had been drawn in the case of the ordinary diurnal variation of the elements of terrestrial magnetism, where normally changes were much larger by day than by night, and much larger in summer than winter.

Prof. G. W. O. Howe pointed out that although the upper

atmosphere undoubtedly had a profound effect on the transmission of electromagnetic waves over long distances, they were still uncertain to what extent long-distance radiotelegraphy would be possible without any assistance from the upper atmosphere. As successive mathematicians attacked the problem, errors were discovered in the previous work, and up to the present the effect of the correction seemed to have been in every case to increase the amount of energy diffracted around the globe.

Prof. Marchant mentioned that recently it was shown that the difference between the carrying power of signals by night and by day was very much greater in summer than in winter.

A paper on "Atmospheric Electricity Observations made at Kew Observatory," by Mr. Gordon Dobson, was read, and a paper on "Thermal and Electrical Conductivities of some of the Rarer Metals and Alloys," was read by Mr. T. Barratt.

A paper entitled "Some Investigations on the Arc as a Generator of High-Frequency Oscillations," by Mr. F. Mercer, was read. This paper contains the results of a series of experiments on the copper-carbon arc when used as a generator of high-frequency oscillations.

ELECTRIC COOKING IN MARINE SERVICE.

The recent trial trip of the U.S.S. *Texas* is of special interest because for the first time a large number of men (715) at sea were entirely dependent upon electric cooking for their daily meals. The results of the trial test on the cooking apparatus were discussed by Mr. J. Mauger, at a meeting of the American Institute of Electrical Engineers.

Data secured during the trial trip demonstrated that the ship's equipment of fifteen ranges and two bake ovens was more than sufficient to care for a crew of 970 men, including seventy officers. The success of the trial is more apparent in view of the fact that none of the cooks had had any previous experience in using electrical apparatus and that they became acquainted so readily with its operation and had no difficulty in performing their prescribed duties.

Of the five ranges installed in the officers' galley four were in use daily. Six to eight of the ten ranges in the crew's galley as well as the two bake ovens were employed simultaneously. Food for 162 men was prepared in the officers' galley and that for 553 men in the crew's galley. The bake

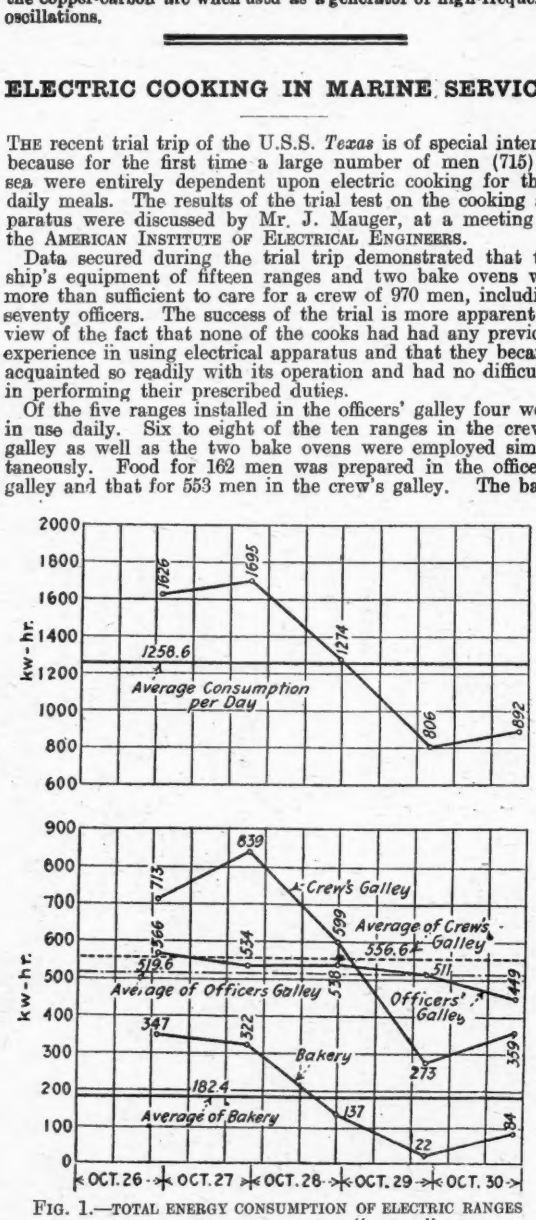


Fig. 1.—Total energy consumption of electric ranges and bake ovens on U.S.S. "Texas."

ovens proved to be sufficient to supply a crew twice as large as that aboard the ship during the trial trip. The officers' galley was in use from 6 a.m. to 9.30 p.m. except for one hour and a half from 2.30 p.m. to 4 p.m. A few hot-plates were kept in service at all times for heating coffee. The crew's galley was in use from 4.30 a.m. to 8.30 a.m., 10 a.m. to 1.30 p.m. and 4 p.m. to 8.30 p.m., depending somewhat on the daily menu.

Two of the accompanying diagrams indicate the average total daily energy consumption and the consumption over a period of four days subdivided under officers' and crew's galleys and bakery. Other curves are shown indicating the variation in load during the preparation of a typical day's meals.

The total daily energy consumption averaged 1,258.6 kw.-hr.; the highest demand was 1,695 kw.-hr. and the lowest 806 kw.-hr. The downward slope of the curve shows a radical increase in economy occasioned by the cooks becoming accustomed to the use of the electric ranges. It is probable that more extended experience would still further increase this economy. The energy consumed per person per day averaged 1.7 kw.-hr. The average total consumption in the crew's galley (556 kw.-hr.) was only slightly more than that in the officers' galley (519 kw.-hr.). The average consumption per man per day in the crew's galley was 1 kw.-hr., as compared with 3.2 kw.-hr. in the officers'. The average daily consumption in the bakery was 182 kw.-hr., or 0.25 kw.-hr. per man.

In accounting for the difference of the energy consumption per man per day in the two galleys, it may be said that about 25 per cent. to 30 per cent. of the cooking in the crew's galley was performed in steam-heated cauldrons, while electricity was used exclusively in the other galley. Another advantage obtaining in the crew's galley was that the ranges could be operated at a better load factor because more food had to be prepared.

Analysis of one of the daily energy-consumption curves in the officers' galley shows that the average demand was 27.4 kw., while the maximum occurring during the preparation of dinner reached 54 kw. Four ranges were in actual use during

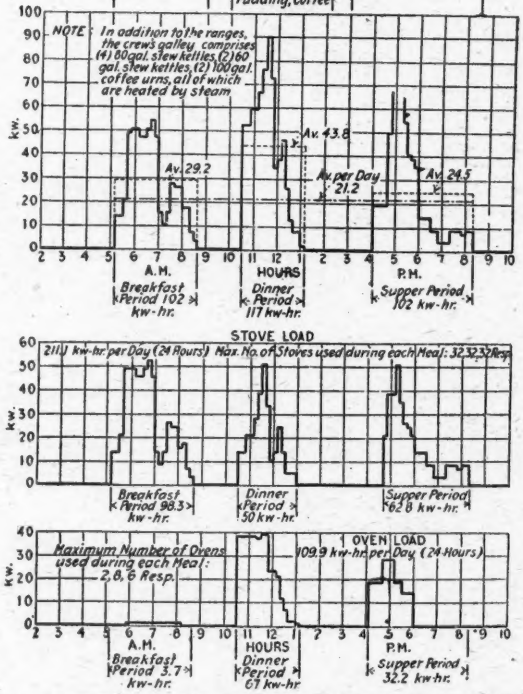

BREAKFAST
Fried Sausages, Fried Potatoes, Beef Stew, Coffee
DINNER
Roast Beef, Fried Sweet Potatoes, Pork, Cabbage, Boiled Potatoes, Rice Pudding, Coffee
SUPPER
Scrambled Eggs, Fried Potatoes, Cold Meat, Salmon, Coffee
NOTE: In addition to the ranges, the crew's galley comprises (4) 80 gal. stew kettles, (2) 60 gal. stew kettles, (2) 100 gal. coffee urns, all of which are heated by steam.
kw.
Av. 29.2
Av. 43.8
Av. per Day 21.2
Av. 24.5
A.M.
HOURS
P.M.
Breakfast Period 102 kw-hr.
Dinner Period 117 kw-hr.
Supper Period 102 kw-hr.
STOVE LOAD
211.1 kw-hr. per Day (24 Hours) Max. No. of Stoves used during each Meal: 3, 2, 3 Resp.
Breakfast Period 98.3 kw-hr.
Dinner Period 50 kw-hr.
Supper Period 62.8 kw-hr.
Maximum Number of Ovens used during each Meal: 2, 2, 6 Resp.
OVEN LOAD
109.9 kw-hr. per Day (24 Hours)
Breakfast Period 3.7 kw-hr.
Dinner Period 67 kw-hr.
Supper Period 32.2 kw-hr.

Fig. 2.—Power consumption of electric ranges in crew's galley.

the preparation of the particular meal referred to. The ratio of the maximum demand to the connected load was therefore about 54 to 120, and the load-factor about 50 per cent.

During the preparation of a typical day's meals in the crew's galley the average demand was 21.2 kw. and the maximum 90 kw., making the load-factor about 24 per cent. Eight of the ten ranges were used, so the ratio of the connected load to the maximum load was 90 to 240. By properly concentrating the cooking in fewer ranges a ratio of 90 to 120 could have been obtained.

The kilowatt-hour curves were taken from wattmeter readings, and the other curves were plotted from ten-minute readings taken throughout the operating periods.

The ranges have a hot-plate area of 888 sq. in.; the broilers measure 18 in. by 24 in. and the ovens 18 in. by 28 in. by 16 in. Each hot-plate requires 1,750 watts maximum, each broiler 4,000 watts and each oven 4,800 watts maximum, making the total connected load in each range 31.6 kw. One range will roast 75 lb. of meat at one time.

The bake ovens require 16 kw. maximum and are capable of preparing 100 loaves of bread. The loaves do not have to be shifted in an electric oven to procure good results as has to be done in the coal-fired type, therefore the heat is not dissipated and wasted through open doors.

The ranges are capable of cooking larger quantities of food than the coal-fired type of the same size, as the compartments usually devoted to fire and ash boxes are utilized as a roasting oven in the electric type.

Another advantage of the electric range is that it is equipped with a broiler, which the coal range lacks. The broilers can be used for toasting, warming dishes and browning the products from the oven.—*Electrical World.*

INDIVIDUAL DRIVING OF SMALL AND MEDIUM SIZE MACHINE TOOLS.

By ADOLF R. STELLING, Dipl.Ing., A.M.I.E.E.

No question is ever raised nowadays as to the commercial value of the electric drive for large or heavy machine tools, but the driving of smaller tools requiring less than 5 H.P. per unit, such as centre lathes and semi-automatic lathes up to 8 in. swing, milling machines up to No. 2 American size, light radial drills, shapers, &c., by means of individual motors, is still regarded askance by machine tool users. Machine tool makers and electrical engineers have combined during the past two years to put forward improved drives, but there is still much room for improvement.

Consider the fundamental differences in the working of heavy and light tools. On heavy tools the period of setting up may take from two to six hours; no one would consider letting the motor run idle during this period. When cutting commences, the tool and its driving motor are usually working at from 75 per cent. to 100 per cent. full rated load for long periods. The electric motor is, therefore, being used very economically, and is a commercial and technical success.

With the small machine tool the conditions are altered. The setting-up time on shapers, millers and centre lathes is long when compared with the actual cutting time. Both being actually short, it becomes inadvisable to stop the motor every time a change is made, especially if direct-current motors are used. Moreover, in the majority of shops the medium size tool is seldom working at its maximum metal-removing capacity. In the case of semi-automatic machines, probably only one of six or eight operations taxes the metal removing capacity of the tool to its rated maximum. With radial drills the discrepancy between the periods of maximum metal removing and light load is still greater. The driving of such tools may therefore be regarded as a constant low load with overload periods of short duration.

Machine tool makers in selling this class of tool make a special feature of the high metal removing capacity and specify motors with a continuous output based upon this capacity. Electrical engineers are almost as much to blame for complying with this specification and thereby increasing the cost of "individual drive."

Practical experience goes to prove that motors of smaller rated outputs but high overload capacities are more suitable from all points of view. The efficiency at light loads (running back, finishing cuts, &c.) is much improved by using a motor of lower nominal rating; the motor, being smaller, can more easily be accommodated on the machine tool, and, above all, the first cost is reduced. With the application of induction motors, the question of the power factor is another argument in support of this contention.

The "all gear" drive of medium size tools is making headway in no uncertain fashion, with the result that constant speed and therefore cheap motors can be used. This, together with the increased distribution of three-phase current, opens a favourable field for the cheap constant speed squirrel-cage type of induction motor, but the problem must be carefully handled on the lines indicated above. One great advantage of the small induction motor is that with such machines as are enumerated above, the clutch can be interlocked with the triple-pole switch, so that current is only used when cutting.

In conclusion, this article puts forward a plea for further investigation and for co-operation between manufacturers of machine tools and electrical machinery. With the advent of cheaper power, a simple, cheap and effective electrical individual drive should prove a commercial success, and manufacturers have every encouragement to strive towards improvements.

A Colliery Installation.—We regret that in our note last week on the installation at the Warwickshire Coal Co.'s Coventry Colliery, the fact that Messrs. Willans & Robinson, Ltd., were the principal contractors for the plant—*i.e.*, the turbo-generators and condensers—was not stated.

BUSINESS NOTES.

Trade Announcements.—Messrs. Gillespie and Beales, of Amberley House, Norfolk Street, Strand, have recently been appointed sole selling agents to the Corporations of Great Britain by Messrs. Charles Mackintosh & Co., of Manchester, for their solid motor traction tires.

Premises situated at the junction of Charles Street and Swain Street, Bradford, will shortly be opened by the Albion Electric Stores, wholesale factors of electrical accessories, who have an establishment at 9, New Station Street, Leeds.

Mr. C. W. Webster, of Whiteley Street, Bingley, sole sale concessionaire for the flame carbons of the Compania Fabril de Carbones Electricos of Barcelona, Spain, announces that despite the demands on his English stock of flame carbons, he is able to execute all orders, as his main supply from the Barcelona works is still kept open.

The British Telephone Supply Co. (late of 17, Bloomsbury Street, Birmingham) announce that their new address (since July 25th) is 4, Slaney Street, Birmingham; telephone number, Central 6392.

Messrs. J. Hopkinson & Co., Ltd., of Huddersfield, announce that they have removed their London office from Queen Victoria Street to more central premises at Imperial House, Kingsway.

The Jandus Arc Lamp and Electric Co., Ltd., of Hartham Road, Holloway, N., inform us that they are prepared to deliver to their customers, for use in Jandus lamps only, sufficient arc lamp carbons for six months' use. The company manufacture the special carbons for their regenerative lamps, and hold a very large stock of raw materials which they anticipate will supply all requirements.

Catalogues and Lists.—The Electrical Apparatus Co., Ltd, Vauxhall Works, South Lambeth Road, S.W.—Leaflet No. H 16, illustrating and giving particulars, dimensions, prices, &c., of the firm's standard direct-current motor starters. New features incorporated are renewable contacts on smaller sizes, and glass inspection windows for completely enclosed types; various extras are also listed, prices are revised, and the firm inform us that, due to their stocks and use of English materials, they are but little affected by the war. Also E.A.C. Notes No. 10, dealing with meters, starters, controllers, &c.

Messrs. Mavor & Coulson, Ltd., 47, King Street, Glasgow.—Monthly "Pick-Quick" coal-cutter card, containing August calendar and data regarding the working of a small D.C. electric coal-cutter.

Messrs. Ralph H. Haylock & Son, 63, Queen Victoria Street, E.C.—Leaflet describing, with illustrations and prices, "Hotpoint" heating and cooking apparatus, viz., the El Glo Stovo, the El Grillo, the Hotpoint iron, and the El Boilo (an immersion heater).

British Thomson-Houston Co., Ltd., Mazda House, Upper Thames Street, E.C.—July-August issue of the "Mazda House News," containing much interesting information on the subject of illumination, Mazda lamp developments, &c.

Messrs. Doulton & Co., Ltd., Lambeth, S.E.—New insulator catalogue, No. 93, 1914, 20 pages, illustrating and describing a large selection of standard stoneware and cream glazed vitreous porcelain cable insulators made at Lambeth. New types are included and prices are given. The firm point out that they are fully prepared to supply the increased demand anticipated from the absence of foreign supplies.

Private Arrangements.—Accumulator Industries, Ltd, Oriental Institute, Woking.—A meeting of the creditors of the above was held on Friday last at Winchester House, Old Broad Street, E.C. The chair was occupied by Mr. W. McLaren, the chairman of the company, who was also the largest creditor. An approximate statement of affairs was presented, which had been prepared by Mr. A. W. Sully, of 19-21, Queen Victoria Street, E.C., who had been appointed to act as the liquidator of the company. The statement disclosed ranking liabilities of £46,229, of which £38,883 was due to Mr. McLaren for cash advanced at various dates. The London and South-Western Bank was scheduled for £945, while the amount due to trade creditors was £6,401. At book values the assets were set down at £8,592, but at a realisation they were expected to produce £3,627. From the latter figure had to be deducted £187 for preferential claims, leaving net assets £3,440, or a deficiency as regarded the creditors of £42,789. The assets were as follows:—Buildings, additions and lease £1,400, estimated to realise £400; machinery, plant and tools, including Dowson plant £4,513, expected to produce £1,600; stock-in-trade, £2,214 9s. 4d., valued at £1,500; sundry debtors, £341, estimated to realise £75, and furniture £50, and calls in arrears £22, expected to produce £2. Mr. Sully said it had been difficult to prepare the statement of affairs owing to the close connection between the company and the Leitner Electrical Co. In taking the stock it had been necessary to differentiate between the raw material and the finished goods. Raw material had been supplied by the Leitner Electrical Co., and work done upon it. An offer had been received from the Rotax Co. to purchase the assets for £1,000, and to take over the stock of pig iron and red lead at market prices. That offer was made conditional on war not breaking out, and, therefore, under the circumstances, the liquidator thought it might be assumed that the offer did not now hold good. It was further stated that the company was formed about 12 years ago, with a nominal capital of £40,000. The issued

capital was £37,318, but the whole of that amount was not subscribed for in cash. Up till 1911 the principal business of the company was putting on the market a system for lighting automobiles. The company worked under a licence granted by Mr H. Leitner, under which they had the right to manufacture according to that gentleman's patents. Mr. Leitner was now a creditor, and a good deal of his claim was in respect of unpaid royalties. In 1911 the company was in financial difficulties, and Mr. Leitner cancelled the licence he had given. Shortly afterwards Mr. Leitner formed the Leitner Electrical Co., and an agreement was entered into between that concern and the Accumulator Industries, by which the latter, under reasonable conditions, was relieved of its liabilities. The company manufactured goods for the Leitner Electrical Co. Last September the Leitner Electrical Co. entered into an agreement with one of the largest firms in the trade. Under the agreement the Leitner Electrical Co. and the Accumulator Industries were to be taken over by the large concern. If the agreement had gone through, all the creditors would have been paid in full. The matter, however, had not gone through, and as the Leitner Electrical Co. was without funds, the present position had arisen. In answer to questions, the liquidator stated that the deficiency shown in the statement of affairs was caused by losses which had occurred over a number of years. A special manager of the Leitner Electrical Co. had been appointed, pending the hearing of a petition which had been presented against that concern. It might be true that some orders on behalf of the company were given by the Leitner Electrical Co., against whom there might be some claim. The Leitner Electrical Co. had been the selling agents for the Accumulator Industries. A resolution was passed by the creditors agreeing to an application being made to the Court for the appointment of Mr. G. E. Corfield, of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C., as joint liquidator with Mr. Sully. A committee of the principal creditors was also elected.

Robert Crust, electrical engineer, Brook Street, Bradford.—The creditors interested herein were called together recently at the offices of Messrs. Heap & Heap, solicitors, of Market Street Chambers, Bradford. The statement of affairs presented showed ranking liabilities of £429, of which £399 was due to unsecured creditors and £30 to cash creditors. There were also preferential claims of £15. The assets consisted of cash at bank £16; book debts £187 estimated to realise £150; and stock-in-trade expected to produce £75. It was reported that the debtor started trading about six years ago with a capital of £100. The turnover of the business had averaged from £800 to £900 per annum. The deficiency was attributed to bad debts, and a loss of £70 on a contract. After discussing the position it was decided that provided the debtor was able to obtain financial assistance from friends the business should be continued with a view to the payment of the debts in full. A committee of the representatives of the three principal creditors was also elected.

Annual Outing.—The Willesden works of the B.T.H. Co. held their first annual outing at Windsor, on Saturday, July 25th. Private omnibuses were hired for the occasion, and the journey was very much enjoyed. On arrival at Windsor the whole party were photographed; subsequently sports were held and prizes awarded to the successful competitors. Boating on the river, inspection of the castle, &c., were followed by a tea served in a large marquee, close to the river, and later, by a concert in which the following contributed to the programme: Misses D. Thomas D. Riley and I. Jones; Messrs. A. de Curtis, B. Townsend, W., Pepper, H. Cameron and F. Bennett.

Liquidations and Dissolutions. — Consolidated Diesel Engine Manufacturers, Ltd.—A compulsory winding-up order was made on July 7th, and Mr. W. B. Peat was appointed special manager to act for the Official Receiver.

The Demon Vacuum Cleaner Co., Ltd.—This company is winding up voluntarily with Mr. A. H. Evans as liquidator.

The British Economical Lamp Co., Ltd.—This company is winding up voluntarily for the purpose of reconstruction with Mr. H. E. Leigh, of Windsor House, Kingsway, W.C., as liquidator.

Book Notices.—*Proceedings* of the Incorporated Municipal Electrical Association, 1914." London: Wyman & Sons, Ltd. Price 5s.

"*Prospectus* of University Courses in the Municipal School of Technology, Manchester, Session 1914-15." Manchester: The School of Technology.

LIGHTING and POWER NOTES.

Aldershot.—New Plant.—The U.D.C. has decided to provide a cooling tower at the electricity works, at a cost of about £400, to be met from the reserve fund.

Bacup.—Mill Driving and Lighting.—The Electricity and Tramways Committee has decided to supply electricity for lighting and power to India Mill, providing that the proprietors, Messrs. Hoyle & Sons, Ltd., contribute towards the cost of the service, and is considering an application from Messrs. Hoyle Bros., Ltd., for a supply of energy for lighting at Olive Mill. The mains are to be extended in Siding Street and the Lee Mill district.

Barrow.—New Mains, &c.—The T.C. has authorised the electrical engineer to obtain new mains and switchgear, estimated to cost £1,400, in order to give a temporary supply of electricity to Messrs. Vickers' works.

Blackburn.—New Generating Station.—The T.C. has authorised a Special Committee to deal with the question of purchasing land at Whitebirk, for the purpose of erecting a new electricity station thereon.

Canada.—According to the *Journal of Electricity*, Messrs. Sanderson & Porter, of New York, have submitted a proposal to the city of Edmonton, Alberta, to furnish power from a plant to be erected at Moose River, B.C., in the Yellowhead Pass of the Rocky Mountains, 250 miles west, at prices ranging from one cent per KW.-hour for the first 50,000,000, to a half-cent per KW.-hour when 120,000,000 is reached. The plant, to be installed on a branch of the Fraser River, will cost $3,500,000. Its minimum capacity is placed at 300,000,000 KW.-hours. The present cost of producing electric power in Edmonton in 1¾ cents per KW.-hour, which is to be reduced to 1½ cents.

Cheshunt. — Proposed E.L. — The Gas Co. has informed the U.D.C. that it has decided not to apply for powers for E.L. in the district, owing to the N. Metropolitan E.P.S. Co. having decided to exercise its power of supplying current. The latter company has given the Council particulars of the scheme, and the question of public lighting is to be considered at an early meeting of the Council.

Chobham.—Proposed E.L. — The Woking Electric Supply Co. has intimated to the P.C. that it is applying to the L.G.B. for powers to supply Chobham with electricity, and the Ascot District Gas and Electricity Co. has written stating that it intends to supply the village with electricity in accordance with powers it already holds. The Council welcomed the advent of electricity from any source, and decided to support the Woking Co.'s application should the Ascot Co. not exercise its powers in a reasonable time.

Continental Notes.—France.—The *Revue Industrielle* gives some interesting details of the growth of electrical enterprise in France. Seven years ago, it says, the number of communes served by electrical distribution networks was under 3,000; this has more than doubled since then, reaching, as it now does, a total of 7,000. In the northern half of France the steam stations have extended their networks and increased their generating stations so that their total capacity now exceeds 500,000 H.P. The hydroelectric works in the Alps, Pyrenees and the Central plateau cover with their networks the southern half of France, and place at the disposition of the industries and population they serve more than 700,000 H.P. The capacity of the generating stations thus exceeds at the present time 1,000,000 H.P. The installations in course of execution or projected stand for another million. The capital invested in power houses and networks reaches at the moment the figure of 1½ milliards, without reckoning the hundreds of millions invested in manufacturing concerns which supply the machinery and material for electrical undertakings.

Dover.—Proposed Loan and Bulk Supply.—The T.C. has decided to apply to the L.G.B. for an additional loan of £500 for E.L. services.

The following terms for the supply of electricity to the S.E. & C.R. Co.'s marine station have been agreed to:—Lighting, from 30,000 to 50,000 units per annum, 3½d. per unit; from 50,000 to 100,000, 2½d.; from 100,000 to 150,000, 1¾d.; beyond, 1d. Power, up to 20,000 units per annum, 2½d. per unit; beyond, 2d. This is subject to an agreement for at least five years.

Eastbourne.—Proposed New Plant.—The E.L. Committee has recommended the T.C. to obtain a new 500-KW. turbo-alternator, at a cost of £4,000.

Charging Battery Vehicles.—The Committee also recommended that an existing dynamo be converted into a charging set for the purpose of re-charging electric battery vehicles, at a rate of 1½d. per unit. The engineer reported that 54 municipalities and three company-owned electricity works are now supplying electric vehicles for charging purposes, at 1d. per unit, or less.

Flaxton.—Overhead Wires.—The R.D.C. has consented to the York T.C. transmitting electricity through the rural district.

Glasgow.—Annual Accounts.—The accounts of the Corporation electricity department for the past year show that the revenue amounted to £378,315, an increase of £32,565 on the previous year, and the expenditure to £200,847, an increase of £30,000, of which £19,000 is accounted for by the increased cost of coal. After allocating £65,040 to interest, £59,388 to the sinking fund and £52,171 to depreciation, there was a surplus of £819. The average price received per unit sold was 1·157d., a decrease of ·13d. Owing to the state of the coal market, the Electricity Committee recommends that the rates, which are as low, if not the lowest, of any in the kingdom, be not reduced.

Great Harwood.—Proposed E.L.—The Accrington T.C. has appointed a sub-committee to consider an inquiry from the Great Harwood U.D.C. for the T.C.'s terms for supplying electricity to the town.

Great Ouseburn.—Overhead Wires.—The R.D.C. has given the York T.C. permission to erect overhead wires in parts of its district for the supply of electricity.

Halifax.—The T.C. has agreed to a proposal of the Tramways and Electricity Committee to supply electricity to Messrs. S. Thornton & Co., of Arden Works, at ½d. per unit, providing the consumption is not less than 750 units per H.P. demanded per quarter, and the annual revenue is not less than £330

Haslingden.—Bulk Supply Conference.—There has been a joint interview between representatives of Haslingden and Accrington T.C.'s with regard to the supply of electricity by the latter authority. The discussion mainly related to items for debit and credit in the cost of production at the electricity works, and eventually the question was deferred. The Haslingden Council asked for a reduction in the price of current in order to permit it to quote special terms for large consumers in the district, but the Accrington Council decided that it could not accede to the request.

Hastings.—Mains Extensions.—The T.C. has decided to lay electricity mains to the Brisco Estate, at an estimated cost of £1,185; 11 public lamps on the route are to be converted from gas to electric lighting, and it is estimated that the annual saving will amount to £16. The Council has also sanctioned the extension of the mains in the west of the town, at a cost of £804, and 19 public gas lamps are to be converted to E.L., at an annual saving of £28.

Holmfirth.—Prov. Order.—The B. of T. has extended the period for carrying out the E.L. order of 1912 by the U.D.C. until August 7th, 1915.

India.—The present electrical plant which supplies power to Darjeeling being taxed to its full capacity, a new scheme has been formed for the supply of current to the two cantonments at Jalapahar and Lebong, as well as the outskirts of the town. The plant, which is estimated to cost Rs. 1,76,000, is to be erected at Phulbazaar, and work will begin on the return of the permanent engineer to the Municipality, Mr. G. P. Robertson, next month.—*Indian and Eastern Engineer.*

Kingston-on-Thames.—Annual Report.—The report of Mr. J. E. Edgcome, borough electrical engineer, on the past year's working of the Corporation electricity department, shows that the total receipts were £15,416, against £14,645 in the previous year, and the working expenses were £8,785, against £8,572. After paying interest, £3,058, and capital repayments, £4,295, there was a deficit of £721, against £833 last year. The total output was 1,242,042 units, against 1,151,988. From April 1st to September 5th, 1913, the works were run entirely by steam, and from then to the end of the financial year (March 31st, 1914), the Diesel engine plant was mainly used, the steam plant being used as a stand-by and on peak loads. The respective fuel costs per unit, including cartage, were: Coal, 1·355d., and oil, 0·450d. The engineer states that it is evident from these figures that, in order to obtain the full benefit of the oil fuel plant, it is necessary to shut down the whole of the steam plant, and tenders for the extension of the oil fuel plant are being obtained. The total cost per unit sold was 1·697d., against 1·867d., and, including capital charges, 3·118d., against 3·306d., while the total revenue per unit was 2·978d., against 3·045d.

Portrush.—E.L. Scheme.—At the last meeting of the U.D.C. a report by Messrs. John Woodside & Co., of Belfast, on the proposed electricity works for Portrush, was presented. The expenditure is placed at £6,488, and the annual revenue at £1,129. Putting the capital charges on a loan of £6,500 at 8 per cent., the net profit would be £109 per annum. The matter was deferred.

Rhyl.—E.L. Inaugurated.—On Friday last week, Mr. T. D. Jones, chairman of the Electricity Committee, started the new electric lighting plant, which has been installed at a cost of nearly £4,000. The new plant is run by a Diesel oil engine, and is in substitution of the old steam sets.

Rotherham.—Loan Sanction.—The T.C. has received sanction to borrow £8,446 for electricity generating plant and circulating water-pipes, £7,768 for mains, and £3,218 for a converting plant and crane.

Salford.—Street Lighting, &c.—The Electricity Committee proposes to replace the existing Brockie-Pell arc lamps in Chapel Street, the Crescent and Broad Street by modern type lamps with lowering gear. The Committee is to arrange with Messrs. C. S. Allott & Son, of Manchester, to advise on the foundations required for the new 5,000-kw. turbo-alternator at the Frederick Road generating station.

Selby.—Proposed E.L.—Negotiations are in progress between the Selby U.D.C. and the Yorkshire Electric Power Co. with reference to the supply of electricity in Selby. The company is applying for a prov. order, and the Council is to consider the matter later.

Southport.—Proposed Destructor.—The Electricity Committee has approved a scheme for the installation of a second refuse destructor at Crowlands, at an estimated cost of £6,000. It is proposed to generate electricity for supply to the electricity undertaking.

Shoreham (Sussex).—Street Lighting.—The U.D.C. has appointed a committee to consider the present system of public lighting in the district.

Stockport.—Market Lighting and Bulk Supply.—The provision of electric lighting for stalls outside the market is to be dealt with by the borough electrical engineer.

The Electricity Committee has instructed the engineer to prepare a report as to the terms upon which a bulk supply of electricity could be given to the Cheadle and Gatley U.D.C., and, as an alternative, as to the price the Committee would charge for supplying electricity direct to consumers in the area mentioned.

Sudbury (Suffolk).—Workhouse Lighting.—The B. of G. is proceeding with a scheme for the lighting of the workhouse by electricity; it is considered that this would save £50 a year.

Tavistock.—Public Lighting.—The U.D.C. has accepted the tender of the E.L. Co. for the installation of public electric lighting to the extent of 20,800 C.P. at £461 per annum. The offer of the gas company was for 17,000 C.P. at £450 per annum.

York.—Overhead Wires.—The T.C. has applied to the B. of T. for permission to use overhead wires for the transmission of electricity at Middlethorpe, at 3,000 volts.

Wotton Without.—The Gloucester R.D.C. has given the Gloucester T.C. consent to supply electricity in this part of the district.

TRAMWAY and RAILWAY NOTES.

Argentina.—The concession granted in 1907 to Messrs. Francke & Co. for the construction of an electric railway between La Plata and Avellaneda has been annulled, and the guarantee deposit of $50,000 has been forfeited.—*Review of the River Plate.*

Belfast.—Proposed Loan.—The T.C. has decided to apply to the B. of T. for sanction to a loan of £2,600 in connection with the doubling of the tramway track at Glengormley.

Continental Notes.—Italy.—The Provincial Council of Genoa has favourably entertained the application for a concession for an electric tramway from Genoa to Casalino, with branches to Scrisia and Voghera. A feature of the undertaking is that it will involve the construction of two tunnels under the Delle Grazie and Creto Hills respectively.

A line is contemplated from Padua to Vicenza, making junction with the Montagnana and Vicenza tramway network, and opening up the chief centres of the provinces of Padua and Vicenza.

Doncaster.—New Tramcars.—The tramways manager has been instructed to obtain estimates for tramcars for the Brodsworth and Warmsworth route.

Free Rides.—In Manchester, Salford, Liverpool, Belfast, London and other centres, military men in uniform have been given the free use of tramways and 'buses. In many cases Reservists and others are to be reinstated on the tramways after the war, and their wives and families are receiving monetary allowances during their absence with the army.

Glasgow.—A special Sub-Committee of the T.C.'s Committee on Tramways has been appointed to consider and report on the desirability and practicability of the tramways department providing cottage dwellings to be rented by workmen in the service of the department.

The traffic and permanent way staffs of the T.C. department have been depleted by about 800 men through members having been called up for service with the Reserves and Territorials, but no reduction has so far been made in the number of cars on the routes.

Rotherham.—The T.C. has been recommended to construct a tramway from Westgate to Effingham Square. The borough engineer is to arrange for the carrying out of the work, to cover the cost of which it is proposed to borrow £3,760. The Tramways Committee has asked permission to instruct the tramways manager to prepare a report on the estimated cost of running motor-'buses in certain districts.

United States.—Railway Electrification.—The contract for the electrical equipment of the Brigham City—Preston extension of the Ogden Rapid Transit Co.'s interurban system has been awarded to the American Westinghouse Co. This extension is 96 miles long, and connects with the Bamberger electric line, which also connects with the Orem line. The Orem line, 50 miles long, is now being electrified, and a 20-mile extension is to be commenced next year. When this is completed, the State of Utah will be traversed from north to south by 200 miles of electric railways.—*Journal of Electricity.*

TELEGRAPH and TELEPHONE NOTES.

Germany.—The latest statistics regarding the development of wireless telegraphy in the German Empire are up to the beginning of 1913. At the beginning of that year there were 23 coast stations and 376 ship stations. Of the coast stations, 12 were open to general traffic, 10 with limitations, and 1 for official use. Of the ship stations, 237 were for public, 134 for official, and 5 for private traffic. The number of wireless telegrams sent from the shore to the ships in 1912 was only 5,312; in the contrary direction, 14,893. Between ships 7,242 telegrams were exchanged. This makes a total traffic in telegrams of 27,447. Receipts for the year totalled 250,000 marks. In these figures the German Protectorates are included.

Solar Eclipse Observations.—The British Association Committee for Radio-telegraphic Investigation states that, owing to the outbreak of war, and the dismantling of private wireless telegraph installations, it will be impossible to carry out the programme of observations during the eclipse on August 21st.

Telephone Censorship.—It is reported that a modified form of censorship has been established over the telephone system of Great Britain. No one is allowed to speak except in English, and those attempting to use any other language are at once cut off.

The Telegraph Service.—The telegraph authorities notify that the deferred rate and week-end letter services to all countries *viâ* France, Teneriffe, Noronha and the Western cables, are suspended.

It is reported that German telegrams to New York are being transmitted *viâ* Copenhagen.

No telegrams of any kind are accepted for places in Germany and Austria-Hungary. Ordinary telegrams for other places abroad, and radio-telegrams, however addressed, can only be accepted at senders' risk and if written in plain English or French. In the case of telegrams for Switzerland and Turkey, French only is allowed. All telegrams are subject to censorship, and must bear the sender's name at the end as part of the paid text, otherwise they are liable to be stopped until the name is notified by paid telegram. Registered abbreviated addresses will not be accepted either as the addresses of telegrams or as names of senders. Ordinary telegrams in code and cipher or without text are prohibited. In order to facilitate the sorting and despatch of mails for places abroad to which dispatches are not made daily, the public are requested to post one or two days before the normal day of dispatch.

United States.—The German-owned wireless plant at Tuckerton has been offered to Mr. Bryan for the transmission to Germany of messages to the American Ambassador in Berlin.

Wireless Station Captured.—By our capture of Togoland, one of the largest wireless telegraph stations in the world has been acquired. The Telefunken Co. established communications between Berlin and Togoland, a distance of over 3,000 miles, mostly overland.

Wireless Stations.—The Bureau International de l'Union Télégraphique has sent a portion of the proofs of the fourth edition of the nomenclature of wireless stations to the printers, and the publication, it is expected, will be ready by the end of the year.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney.—August 31st. Sydney Harbour Trust. Four electrically-operated semi-portable travelling cranes. Forms of tender from Mr. H. F. Norrie, Secretary to the Trust, Sydney.

September 14th. Municipal Council. 22,500 yd. of 33,000-volt, three-core, paper-insulated, lead-covered cable. Deposit £200. Specification, 10s. 6d., from the City Electrical Engineer; a copy may be seen at the B. of T. Commercial Intelligence Dept., London.

Brisbane.—September 2nd. Measuring instruments, protectors and parts, telephone and telegraph instruments, for the Postmaster-General. See "Official Notices" July 31st.

Adelaide.—Sept. 9th and 23rd. Telephone material, microphones, protectors, &c., switchboards, bells and cells, for the Postmaster-General. See "Official Notices" July 31st and August 7th.

Adelaide Tramways Trust.—September 1st. One booster set, with cables and spares.—*Australian Mining Standard.*

Melbourne.—August 18th. Electricity recording meters and carbon brushes, for the Melbourne City Council. See "Official Notices" July 31st.

August 26th. Insulated copper wire, for the Melbourne City Council. See "Official Notices" to-day.

September 23rd. 102 electric motors, starters, switchboards and wiring for installing electrical drive at Messrs. Sands & McDougall, printers. Mr. M. C. Coates, consulting engineer.—*Tenders.*

Victorian Railways Department.—October 7th. Motors and switchgear, and motor-driven air compressors for the Ballarat and Bendigo workshops.

Perth.—September 9th. Coin attachments for Postmaster-General. See "Official Notices" to-day.

Belfast.—August 24th. Corporation. One electric motor tower-wagon. See "Official Notices" July 31st.

Coxhoe and Kelloe.—August 17th. Parish Council. Poles, lamps, cables, &c., for electrical installation. Specifications from Mr. J. W. Anderson, Engineer, East Hetton Colliery, Coxhoe.

Earsdon (Northumberland).—August 15th. U.D.C. For the supply of poles, cables, lamps, &c., in connection with the extension of public lighting. Particulars from Mr. J. R. MacMillen, Surveyor, Council Offices, Shiremoor.

Eastbourne.—August 18th. Corporation. Main machine and feeder switchboard for the electricity works See "Official Notices" July 24th.

Edinburgh.—August 17th. Corporation. Extensions to the electric lighting installation at the City Museum. Specification from the Engineer's office, Dewar Place.

August 17th. Corporation. Electric light installation at the public wash-house, Greenside. Specifications from Mr. F. A. Newington, Engineer, Dewar Place.

August 17th. Guardians. Electric light installation at the laundry, Craiglockhart Poorhouse. Specification from Mr. R. M. Cameron, 53, Great King Street, Edinburgh.

Kingston-upon-Hull.—August 22nd. Corporation. Electrical fittings for the Guildhall Council Chamber, &c. See "Official Notices" July 24th.

At a meeting of the T.C. on August 6th, the Property Committee, reporting on the invitation for tenders for the supply of electrical fittings for the Guildhall, stated that the architect had submitted a condition that the whole of the work must be carried out on the premises of the contracting firm, and be available for inspection and supervision of the architect or his representative at any time during progress, and that it must be clearly understood that the successful firm would not be allowed to sublet any portion of the work. The Committee recommended the acceptance of these stipulations. Col. Easton took strong objection, and moved reference back to the Committee. Mr. Larard, supporting, said that in his opinion the London architect engaged on the work at the Guildhall was endeavouring to bind them down too much. The Chairman of the Committee (Ald. Hall) said that so far as he was concerned he had never found a more harmonious man to work with than the architect, and he had never seen any indication that he wanted to be master. The reference back was agreed to.

Lisnakea.—August 15th. Wiring the workhouse and auxiliary buildings with necessary fittings, &c., for the B. of G. Specifications from Mr. J. O'R. Hoey, Clerk.

London.—L.C.C.—September 8th. Cables, H.T. and L.T., and laying stoneware ducts (tramways). See "Official Notices" August 7th.

September 8th. Reconstruction of motor-generators in the tramway southern sub-stations. See "Official Notices" to-day.

Manchester.—August 25th. Tramways Committee. Tenders for cast-iron pipes for heating purposes. Particulars from Mr. J. M. McElroy, General Manager, 55, Piccadilly.

Middlesbrough.—September 12th. Corporation. Three electric motor-driven sewage pumps, priming pumps, metering arrangement, pipework, overhead travelling crane. See "Official Notices" to-day.

Newport (Mon.).—August 17th. Corporation. Converting plant, &c. See "Official Notices" July 31st.

New Zealand.—New Plymouth.—August 28th. 6,600-volt sub-station switchboard, contract No. 10: additions to 2,300-volt sub-station switchboard, contract No. 11, for the New Plymouth B.C. Specifications from the Board of Trade Offices, London.—*New Zealand Shipping and Commerce.*

Oldham.—August 16th. Corporation. D.C. motor-generator and extension to E.H.T. switchboard. See "Official Notices" July 24th.

August 24th. Corporation. Three economisers and three induced-draught fans and motors. See "Official Notices" July 31st.

August 24th. Corporation. Storage battery, reversible booster and switchgear. See "Official Notices" August 7th.

Paris.—August 21st. Tenders are invited for the supply of a 20-metre sliding platform for the Vaugirard depôt. Particulars from the Bureaux du Service Electrique (1e division), 43, Rue de Rome, Paris.

Rathmines (Co. Dublin).—August 17th. U.D.C. 400 tons of steam coal, for the electricity works. Particulars from the electricity works.

Spain.—The municipal authorities of Villanueva del Rey (Province of Cordova) are inviting tenders until the 27th inst. for the concession for the electric lighting of the town during a period of 10 years.

South Africa.—August 31st. 22 electric motors for the Salt River workshops, for the administration of the South African Railway. Copies of specification from the Secretary to the Tender Board, S.A.R., Headquarters Office, Johannesburg.

East London, C.P.—Tenders will shortly be invited by the Municipality for material for duplicating the existing tramway track at East London, C.P. and rearranging the overhead equipment, &c. Estimated cost, £7,814. Particulars from the Town Clerk, Municipal Buildings, East London, C.P.

Germiston, Transvaal.—Material and equipment for a two-mile extension of the tramway system. Particulars from the Town Clerk, Germiston.—*Brit. and S.A. Export Gazette.*

Sunderland.—August 18th. Corporation. Two 1,500-kw. motor-generators or rotaries. See "Official Notices" July 31st.

Swinton and Pendlebury.—August 19th. U.D.C. Cables, fittings, &c. See "Official Notices" July 31st.

Walthamstow.—August 19th. U.D.C. Supply and delivery of tramway rails, castings, fishplates, &c. Forms of tender from Mr. E. Morley, Surveyor to the Council.

West Hartlepool.—August 17th. Corporation. Machine tools for tramways depôt workshops. See "Official Notices" July 31st.

Woodford Green.—August 18th. U.D.C. Installation and maintenance of the Knight system of fire-alarms. Particulars from Mr. W. Farrington, Surveyor, Council offices.

CLOSED.

Bridlington.—The T.C. has accepted the tender of Mr. W. B. Wilson for 2,000 tons of Bullcroft Main washed small coal, for the electricity works, at 13s. per ton. Sixty-six tenders were received.

Crewe.—The Health Committee has accepted the tender of Messrs. Carrington & Button for six magneto instruments and switchboard at the hospital, for £26.

Faversham.—The T.C. has accepted the tender of Messrs. Honeyball & Son for coke for the electricity works, at 17s. 6d. per ton.

Glasgow.—The Tramways Works and Stores Committee has accepted the following tenders for special work:—The Lorain Steel Co. and Hadfield's Steel Foundry Co.

The Watching and Lighting Committee has accepted the offer of Messrs. Watson & Whyte for 1,000 electric hand-lamps for the police force, at 13s. 9d. each.

Grimsby.—The Public Lighting Committee has accepted the following tenders:—

Tudor Accumulator Co., Ltd., £3,116 for a Tudor battery, a Phœnix booster and Bertram-Thomas switchgear; Swaby & Walsham, £1,538 for building battery room, &c., at the electricity works.

London.—St. Pancras.—The British Niclausse Boiler Co., Ltd, has been awarded the contract for four boilers, complete with Niclausse stokers, superheaters, and economisers, fitted with forced and induced draught, chimneys, and other accessories. Each unit is to be capable of evaporating 40,000 lb. of steam per hour at 120° F. at a steam pressure of 220 lb. per sq. in., superheated 250° F.

Manchester.—The Electricity Committee has accepted the following tenders for the supply of stores for 12 months:—

Asbestos goods.—Witty & Wyatt, Ltd.
Brass and copper work.—Till & Whitehead.
Canvas and Hessian.—L. Andrew & Co.
Lead-covered cables.—Union Cable Co., Ltd.
Service cables.—W. T. Glover & Co., Ltd.
Cement.—Ship Canal Cement Mfg. Co., Ltd.
Cotton waste and rags.—W. C. Jones, Ltd.
Dynamo brushes.—R. Johnson, Clapham & Morris.
Earthenware bridges, pipes, bends, insulator blocks.—Doulton & Co., Ltd.
" stretchers, pipes, bends, siphons and grids.—Isherwood Bros.
Electrical accessories.—Falk, Stadelmann & Co., Ltd., B.T.H. Co., Ltd., and G.E. Co., Ltd.
Fire-bricks and fire-clay.—Glenboig Union Fire Clay Co., Ltd.
India-rubber goods.—L. Andrew & Co., G. MacLellan & Co.
Insulators.—Bullers, Ltd., Doulton & Co., Ltd., Sloan Electrical Co., Ltd.
Iron castings.—Hendsford Foundry Co, Ltd., J. & S. Eyres, Ltd., J. Stubbs, Ltd., Holwell Iron Co., Ltd., J. Turton.
Iron pipes (cast).—Stanton Ironworks Co., Ltd.
Iron and steel.—Hall & Pickles, Ltd.
Leather belting.—P. Haworth & Co., Ltd.
Balata belting.—C. Mackintosh & Co., Ltd.
Manhole flaps.—Crosfield & Seddon.
Paints.—J. E. Williams & Co.
Rubber tape.—L. Andrew & Co., W. T. Glover & Co., I.-R., G.-P., and Telegraph Works Co., Ltd., W. T. Henley's Telegraph Works Co., Ltd.
Steam and gas fittings.—John Russell & Co., Ltd., Jas. Russell & Co., Ltd.
Insulating cloth.—Meirowsky & Co.
Wood cable-troughing.—A. Bruce & Co.
Cast-iron cable-troughing.—Coalbrookdale Co., Ltd.
Diatomite asbestos non-conducting composition.—Diatomite Co., Ltd.
Crucibles.—Morgan Crucible Co., Ltd.
Blackley tape.—Connolly Bros., Ltd.
Alkali.—Brunner, Mond & Co., Ltd.
Creosote and common tar.—Hardman & Holden, Ltd.
Anti-sulphuric enamels.—Griffiths Bros. & Co.
Evertite jointing.—B. L. Ross & Co., Ltd.
Soldering paste.—W. T. Burnley & Co.
Tubing and fittings.—Brotherton Tubes and Conduits, Ltd., Simplex Conduits, Ltd.
Tubing.—Eureka Conduits and Fittings Co.
Dry cells.—A. H. Hunt.
D.C. wire, silk-covered, and Eureka wires.—London Electric Wire Co. and Smiths, Ltd.
Enamelled wire.—Connolly Bros., Ltd.
Nickel chrome wire and strip.—H. Wiggin & Co., Ltd.
Tinned steel and armature wires.—W. N. Brunton & Son.
Recorder paper.—Elcho Recording Press.
Varnish.—Pinchin, Johnson & Co.
Commercial hydro and sulphuric acids.—H. M. Morris & Co.
Boiler tubes (land type).—Babcock & Wilcox, Ltd.
" (marine type).—British Mannesmann Tube Co., Ltd.
Box composition and bitite tape.—Callender's Cable and Construction Co., Ltd.
Gauge glasses.—S. & C. Bishop & Co.
Metal polish.—Matchless Metal Polish Co., Ltd.
Engine paste.—G. McLaren & Son.

The Committee has also accepted the tenders of Messrs. A. Bruce and Co. and the Coalbrookdale Co., Ltd., for wooden troughing and iron troughing respectively up to June 30th, 1916; and also the tenders of the B.I. & Helsby Cables, Ltd., and the Electrical Engineering and Equipment Co., Ltd., for supplies of cables.

The Tramways Committee has accepted the tender of Messrs. C. H. Normanton & Son, Ltd., for the erection of offices in Barlow Moor Road, and that of Messrs. Heaton & Son, for two steel boilers for heating purposes at the Hyde Road car works.

The Education Committee has accepted the tender of Messrs. W. P. Theerman & Co., for electrical installation at the Mill Street School.

The tender of the Keighley Electrical Engineering Co., Ltd., for wiring at Abergele Sanatorium, has been accepted by the Sanitary Committee.

Middleton.—The Electricity Committee has accepted the tender of Messrs. E. Green & Son, for economisers.

New Zealand.—Post and Telegraph stores:

Richardson, McCabe & Co., 7,000 dry cells, £246; Phillips & Pike, 500 Gordon cells, £347; B. L. Donne, 3,000 wall telephones, £7,527; A. and T. Burt, Ltd., 100,000 insulator cups, £1,627, 100,000 insulator bolts, £1,173; ditto, swan-neck bolts, £265; Lawrence & Hanson, 80,000 yards jumper wire, £96; Richardson, McCabe & Co., 3 tons annealed copper wire, £242.—*New Zealand Shipping and Commerce.*

Salford.—The Town Hall Committee has accepted the quotation of Messrs. Halliwell & Co., Manchester, to provide an electrical installation at the Town Hall, and also wiring for two hoist motors, for £29.

Sheffield.—The Corporation Tramways Committee has accepted the following tenders for coal to June 30th, 1915:—Mr. G. Turner, 11s. 6d. per ton; Messrs. Rose & Co., 11s. 8d. per ton; Messrs. J. Ward, Ltd., 11s. 9d. per ton; and Messrs. M. C. Burnby & Sons, 11s. 11½d. per ton.

Torquay.—The T.C. has accepted the tender of Messrs. Matthews & Yates, Ltd., for an induced draught fan, &c., for the electricity extension works, at £252, and that of Messrs. Poulton, Timmis & Co., for boiler setting, at £220.

Whitefield.—The U.D.C. has accepted the tender of the Lancashire Electric Power Co. for the electric lighting of the offices and Council chamber, for the sum of £31.

Wolverhampton.—The Corporation Electricity Committee has accepted the tender of Messrs. G. Robson & Co., for four sets of coal-measuring apparatus for the new boiler plant, at £190.

FORTHCOMING EVENTS.

Salford Technical and Engineering Association.—Saturday, August 22nd. Visit Chronicle Printing Works, Withy Grove, Manchester.

Association of Mining Electrical Engineers.—Saturday, August 22nd. Visit Wallsend and Hebburn Coal Co.'s Pit.

NOTES.

National Service for Electrical Engineers.—The Council of the Institution of Electrical Engineers has issued a circular to the members pointing out that there are two important directions in which they may be of great service to the nation at the present time:—

First: To place their services as electrical engineers at the disposal of the War Office and the Admiralty.

Secondly: To be in readiness to fill vacancies in public services, electric power stations, tramways, railways, &c., caused by the calling up of the Reserves and Territorial Forces.

With the view of being ready to assist the authorities and the public services, the Council has decided to prepare classified lists of suitable men, and for this purpose has asked members who are in a position to assist in any of the directions indicated, to fill in and return a form giving full particulars of the occupations for which they are fitted. It is assumed that the rates of pay would be the current rates for the services rendered.

The Council desires not only to receive offers of services from members of the Institution, but also that all members should assist it to obtain the names of as many qualified men as possible (whether or not members of the Institution) willing to offer their services in the directions indicated. For this purpose additional sets of papers are enclosed with the circulars. Full information can be obtained from the Secretary, Mr. P. F. Rowell, at the Institution, Victoria Embankment, W.C. We refer to the matter in our leading columns.

The Council has offered to place at the disposal of the War Office, for immediate occupation and free of charge, the available portions of the Institution building, of a total area of 10,000 sq. ft.

Educational Notes. — Northampton Polytechnic Institute.—The next session opens September 28th. Particulars of the courses in engineering and technical optics appear in our advertisement pages to-day.

University of Edinburgh (Engineering Department).—The next session begins on October 13th. Particulars appear in our advertisement pages to-day.

University College: Faculty of Engineering.—We have received the handbook of the Faculty for the forthcoming session, which gives particulars of the arrangements and courses of instruction, as well as of the scholarships, &c., that are available at the College. Prof. J. A. Fleming is the Dean, and Prof. E. G. Coker, Vice-Dean, of the Faculty of Engineering.

Volunteer Force to Protect Electrical Apparatus.—A correspondent writes as follows:—"There is without doubt at the present time an urgent call for men who have a practical experience of electricity, and I suggest you should form a corps of volunteers who are prepared to devote their whole or spare time to providing a practical electrical contingent willing to accept service for the defence of all and every electrical apparatus. The force to be used for protection work in the home counties only.

"It would of course be advisable to arrange that such a corps had the recognition of the Government. May I express the hope that this suggestion will meet with approval, and I shall have the pleasure of being one of the first members. It would, of course, be necessary to have an understanding that all members required officially in other directions would be released immediately."

The importance of protecting electricity works, sub-stations, &c., from malicious interference is obvious. It seems to us, however, that the multiplication of organisations should be avoided, and we suggest that the proposal be considered either by the I.E.E. in conjunction with the scheme which is published above, or by the Volunteer Civil Force of which particulars are also given to-day.

Flying Corps Appeal for Men.—The Royal Flying Corps, Military Wing, urgently calls for the special enlistment of tradesmen for one year, or for the duration of the war. Men of the following trades are urgently required:—Blacksmiths, cable-joiners, carpenters and joiners, clerks, coppersmiths, draughtsmen (mechanical), drillers, dynamo attendants, electric-bell fitters, electricians, engine-testers, fitters, instrument repairers, joiners, metal joiners, motor fitters, painters, pattern-makers, photographers, plumbers, riggers, sail makers, switchboard attendants, tinsmiths, tool grinders, turners, wheelwrights, whitesmiths, wireless operators, wiremen, wood-turners. Men who have served as apprentices or improvers in a general mechanical engineering workshop, and in addition have served at full rate in a petrol motor engineering works, including experience in the engine-test shop, or have served as aeroplane mechanics. They should have a good knowledge of general motor engineering, and a thorough knowledge of the principles of magneto and coil ignition, and be able to make intelligible sketches of machinery details and rough calculations connected therewith. Pay varies according to trade, from 4s. to 7s. 6d. per day, all found. Applicants for enlistment should apply in person to the Craig's Court entrance of the Central London Recruiting Depôt, or to the officer commanding the Military Wing, Royal Flying Corps, Farnborough, Hants., and must be prepared to furnish certificates of character, of previous trade experience and of present trade qualifications.

Electrical Companies and the War.—From all sides we have received information to the effect that electrical companies are resolved on keeping their men fully employed during the war, and that the normal conditions of business will be preserved as far as possible. Large numbers of their employés have been called out, as Reservists or Territorials, and with one accord the employers declare their intention to provide for the families of the married men and the dependants of the unmarried on a generous scale. Many firms have requested us not to refer to them by name in this connection, and in justice to them we feel that it would be invidious to name others; but if the restriction is removed, we shall be pleased to publish particulars of the arrangements that have been made, which in every case do honour to the sentiments by which the employers are actuated. In some instances they have gone so far as to pay full wages to the married men on active service, in addition, of course, to the pay that they receive from the Government; more usually half wages are paid, and in no case has the rate been less than 10s. a week. Moreover, in every instance that has come to our knowledge, the men who are called out on naval or military service will be reinstated on the termination of their active service. The manner in which our electrical firms have dealt with the situation reflects the greatest credit upon the industry.

Cable Transport Vehicles.—Messrs. Adolph Saurer, of Arbon, Switzerland, have recently supplied to the postal authorities in Munich a 3-ton petrol motor lorry with two special trailers for transporting large cable drums, as well as telegraph poles or piping, without difficulty. The two trailers can be coupled together, thus forming a self-contained unit, which can be drawn by horses when the cable drum is empty or when the motor vehicle is employed elsewhere. The chassis of the latter is driven by a 36-H.P. motor, and is also provided with an electric motor for driving a cable winch to assist in loading operations. Above the rear axle is mounted a swivelling attachment for the three-wheeled cable drum trailer, or a swivelling bolster to carry telegraph poles, &c., when the two-wheeled pole trailer is in use. In the former case, half of the platform is available for carrying tools or other articles. The cable drum trailer runs on two main wheels, and has a small front wheel mounted on a screwed vertical spindle, which arrangement allows the trailer to be easily attached to or detached from the tractor vehicle; when coupled to the latter the trailer only travels on its two rear wheels. The trailer is provided with a simple worm-operated lifting gear, which enables the drum to be placed in position without the aid of a crane or other lifting appliance. It is also fitted with a brake which can be applied by a hand lever from the driver's seat. Cable drums varying in diameter between 3¼ and 8¼ ft., up to a width of 4 ft., and of a maximum weight of 5 tons, can be carried. The pole of the two-wheeled trailer is coupled to the rear end of the tractor vehicle frame in the usual manner, and its bolster is also provided with a special coupling for attaching the cable drum trailer.

Sea Transport.—On Monday night the Admiralty stated that permission to ship coal from this country to Norway and Italy could be obtained on application to the Customs officer of the port of shipment. This announcement indicated, said the *Times*, that no undue risk was likely to attach to British ships crossing to Norway, or making the passage to the Mediterranean. The removal of two German warships in the Mediterranean from active service clears the route to the East, and the German cruisers in the Atlantic are being hunted down by British warships.

German Patents.—In reply to a question in the House of Commons, Mr. Runciman stated that the Board of Trade had taken power to deal with cases in which the manufacture of materials required by British industries was covered by German patents; the Board could make rules to meet such cases, and the matter was under consideration.

An Electrical Farm.—Our special correspondent in Norway writes that in the agricultural department of the Exhibition at Christiania there is, among other exhibits, an entire farm with buildings, in which electricity seems to have taken the place of servants altogether, and made them almost superfluous.

The energy for this model farm is supposed to come from a small waterfall in the neighbourhood that has been harnessed. The visitor is first of all struck by the splendid appearance of the fields, which turns out to be due to the employment of artificial manure electrically manufactured. In the evening the house, the yard, stables and outhouses are radiant with electric light. In the kitchen there is an electrical oven, with four hot plates, a roasting oven, and a baking oven. When the food is cooked, it is placed in an electrical heating apparatus. There are also electrical apparatus for cooking eggs and heating water. In the pantry there is a small motor of ½ H.P., to which can be coupled nine different machines, such as a sausage mill, coffee mill, knife polisher, machine for cutting bread, ice machine, and a press to obtain juice from berries. The whole house is heated by means of electricity. In his bedroom the farmer has an electrical apparatus for heating water for a shave, and the housewife a neat electrical hair-curling apparatus.

In the wash-house is installed a 3-H.P. motor, driving a washing machine and an electrical centrifugal drier as well as an electrical mangle and an electrical iron. The workshop is equipped with an electrically-driven lathe, saw, grind-stone, glue heater and soldering iron. In the stables for cows and horses there is a motor of ½ H.P., to which apparatus for rubbing-down horses and shearing sheep can be coupled. There is also a milking apparatus, the "Omega," which is driven by a 1-H.P. motor. In the same building is a portable 10-H.P. motor, which supplies power for working the threshing machine and other agricultural machines.

An electrical incubator is shown in another part of the Exhibition. The whole exhibit shows excellently how the conditions of a farmer's life can be improved and how pleasantly and easily nearly all the work can now be carried out electrically.

Institution Notes.—North-East Coast Institution of Engineers and Shipbuilders.—The North-East Coast Institution of Engineers and Shipbuilders (Incorporated) was registered on August 7th as a company limited by guarantee, with an unlimited number of members, each liable for £1 in the event of winding up. It will take over the assets and liabilities and continue the work of the unincorporated institution established in 1884 and known as the North-East Coast Institution of Engineers and Shipbuilders.

American Association for the Advancement of Science.—The Association will hold its next Convocation-week meeting in Philadelphia, Pa., from December 28th, 1914, to January 2nd, 1915. The annual meetings are usually attended by 2,000 or more of scientific men and women, and it is expected that the coming meeting will surpass previous meetings in the importance of its scientific programme. Particulars can be obtained from Mr. L. O. Howard, Smithsonian Institution, Washington, D.C., U.S.A.

Appointments Vacant.—Cable jointer, for Dundalk U.D.C. electricity department (9½d.); shift engineer (£2), for Stretford U.D.C.; switchboard attendant (30s.), for Newcastle and District Electric Light Co.; instructor in electric wiremen's work (12s. 6d. per evening), for East Ham Technical College Evening Classes. Particulars are given in our advertisement pages.

British Association's Australian Tour.—Information has been received in London from the officers of the British Association in Australia to the effect that the oversea party has arrived there safely, and that the meeting is proceeding in accordance with the original programme.—*The Times.*

The Course of Trade.—In connection with the questions discussed elsewhere in this issue regarding the diversion of trade from the Continent to this country, the following remarks by Mr. Bonar Law, reported in the *Times* of August 7th, are interesting:—"If we keep the command of the sea, what is going to happen? Five-sixths of our production is employed in the home trade. What goes abroad is very important, and, of course, if the population which supplies this one-sixth were thrown out of work, that would react on the whole. But, after all, the total amount of our exports to all the European countries which are now at war is only a small part of our total exports. There is here no question of fiscal policy. We are far beyond that. It is a question of fact. Our total exports to all the countries which are now at war do not, in my belief—I have not looked into the figures—exceed our exports to India and Australia, taken alone. Now, consider this: we shall have freedom of trade, if the command of the sea is maintained, with the Colonies and with the whole of the American Continent, while, unfortunately for them, both our allies and our enemies will not be competing with us in these markets. Look at it as a problem. I think we have a right to believe, not that trade will be good, but that it will be much more nearly normal than is generally supposed."

Fatality.—Carnarvon.—A verdict of "Death as a result of shock" was returned at an inquest held by Mr. P. Williams, at Carnarvon, on Stella Jones (17), whose family resides at and has charge of the telephone exchange. During the thunderstorm one night last May Miss Jones went to answer what she supposed was a telephone call, when she received an electric shock which numbed her right side. A fortnight ago she was removed to the cottage hospital, and she died there last Saturday. The medical certificate was to the effect that the primary cause of death was shock which latterly developed into cardiac dilatation. Inspector Ellison, who gave evidence on behalf of the Post Office, said that under the circumstances prevailing at the exchange where they had special floors and where the wires were protected, it was impossible for an operator to receive a shock.

Parliamentary.—Third Reading.—In the House of Commons, on August 5th, the Glasgow Corporation (Tramways, &c.) Bill was read a third time.

National Relief Fund.—We have been invited by Mr. C. Arthur Pearson to draw attention to the Prince of Wales's National Relief Fund; we feel sure that many of our readers, who are unable to render service in other ways, will be glad to assist in mitigating the sufferings of those to whom the war will bring only grief and distress. Contributions should be addressed to H.R.H. the Prince of Wales, Buckingham Palace, London, with a statement of the amount, and the name and address of the sender. The envelope need not be stamped.

Electric Light Switching Examination.—The following is a complete list of successful overseas competitors in the last examination in electric light switching conducted by Messrs. A. P. Lundberg & Sons, of Liverpool Road, N.:—

Advanced Grade.—A. W. Honychurch, Christchurch, Barbadoes, West Indies.
H. S. Tiley, Potchefstroom, South Africa.
Intermediate Grade.—H. R. Constantine, M.Sc. Tech., Student I.E.E., Zug, Switzerland.
R. Drilhon, Pau, France.
Preliminary Grade.—H. Cristall, London, Ontario, Canada.
A. K Dass, Delhi, India.

The next examination will be held in November, and particulars may be had on application to Messrs. Lundberg.

The Supply of Ignition Magnetos.—A meeting of British motor manufacturers was held in Coventry on Wednesday last for the purpose of making arrangements for the supply of magnetos for motor-cars and motor-cycles. As is well known, large numbers of these have been purchased in the past from Germany, but, of course, this channel of supply is now stopped. A representative committee was appointed to communicate with English electrical firms with the view of obtaining supplies of magnetos in the future, and all firms desirous of entering into these important branches of the motor trade are requested to apply to the convener of this meeting, Mr. Harry Smith, The Rover Co., Ltd., Coventry. Some important British firms have already expressed their intention of going into this trade.

Wreck.—From the *Shipping World* we note that the steamship *Buccaneer*, belonging to the India-Rubber, Gutta-Percha, and Telegraph Works Co., Ltd., was wrecked near Tamatave on August 4th. We are glad to add that on inquiry, we learn that the staff and crew were rescued.

"Wireless" Men for the Navy.—Wireless telegraph operators who wish to enrol in the Royal Naval Reserve for service in the Fleet should apply immediately direct to the Commodores at the Royal Naval Barracks at Chatham, Portsmouth or Devonport, who will furnish particulars of the conditions of service.

Training for National Service.—The Empire League of Freedom, at its North London Rifle Club, 211, High Street, Camden Town, gives instruction to men over enlisting age and for women:—

1. In aid to civil authority.
2. Shooting and drill to qualify as second reserve for defence, armed patrols, &c.
3. First aid and ambulance work.

The instruction is free, the only charge being 3d. per 10 shots for cartridges and target, but all who can afford are asked to join the club, 6s. per annum, or larger subscriptions by those who can afford them. Most of the trained men of enlisting age have volunteered for active service. The League is conducted entirely by unpaid organisers, and Mr. G. W. de Tunzelmann (chairman), Mr. H. F. Wyatt (Joint Founder of the Imperial Maritime League), and Lieut.-Col. J. C. B. Craster (Hon. Secretary), appeal for support for this work.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. Ogden and Mr. Chamberlain have been appointed as joint electrical engineers for the borough of Oldham, in place of the late Mr. Newington. Mr. Ogden is to take charge of the inside work, and Mr. Chamberlain of the outside work, but in the absence of either the other will have entire control.

The Sheffield T.C. proposes to appoint Mr. Charles W. Erskine as sub-station assistant at a salary of £117 per annum. The Establishment Committee proposes that the salary of Mr. A. S. Frost, assistant station superintendent in the electric supply department, be increased from £200 to £225 per annum as from January 1st, 1915, with further annual increments of £25 to £300 per annum.

The Worksop U.D.C. on Monday appointed Mr. T. Allsop as meter inspector and repairer; and Mr. E. Linay as switchboard attendant at the electricity works.

The Newcastle-under-Lyme Corporation has increased the salary of the borough electrical engineer, Mr. A. J. C. De Renzi, by £25 per annum, the question of a further increase to be deferred until the end of the present financial year.

The Wolverhamption T.C. has been recommended to grant the following increases of salary:—Mr. G. Stubbs, chief engineer, from £200 to £225; Mr. T. Smith, distribution engineer, £245 to £270; Mr. E. Forder, engine room superintendent, £150 to £165; Mr. C. Billhouse, boiler house superintendent, £150 to £165.

General.—The marriage took place at Crossstone Church, Todmorden, on July 25th, of Mr. Wm. Duckworth, A.M.I.E.E., of Cork, and Miss Elsie Redman, of Todmorden.

On the occasion of his marriage at Westcliff, Southend-on-Sea, on August 5th, Mr. Stanley J. H. Paxman was presented by the staff of the Eastern Telegraph Co. with a case of silver and cutlery.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Egyptian Delta Light Railways, Ltd.—Particulars of £645,380 debentures to bearer created by resolutions dated from March 25th, 1897, to July 10th, 1914, and secured by trust deeds of various dates, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £34,000. Property charged: The company's undertaking and property, present and future, including all shares, debentures, securities and railways, subject as to property purchased from La Compagnie des Chemins de fer Economiques de l'Est, Egyptian, to a prior charge securing £233,300 3½ per cent. debentures. Trustees: M. Sharp, L. J. Lumley, Earl of Ronaldshay, M.P., and the Hon. Vicary Gibbs.

Collingwood & Co., Ltd.—Debenture dated July 27th, 1914, to secure £150, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. O. Collingwood, 68, Vine Street, E.C.

Tucuman Tramways, Light and Power Co., Ltd.—Trust deed dated July 8th (supplemental to trust deed dated May 20th, 1914, securing £400,000 debenture stock). Trustees: City Safe Deposit and Agency Co., Ltd., 13, Throgmorton Avenue, E.C., and M. W. Mattinson, K.C., 1, Garden Court, Temple, E.C. No property is actually charged by this deed, but the deed contained a covenant by the company to do and execute at the request of the trustees all such acts, deeds and things necessary to institute any assets in the Argentine Republic which may be acquired with the proceeds of the debenture stock secured by original deed a valid floating security according to the laws of the Argentine Republic.

Aron Electricity Meter, Ltd. (58,650).—Capital, £350,000 in £1 shares (225,000 ordinary and 125,000 preference). Return dated July 14th, 1914. 125,000 ordinary and 124,896 preference shares taken up, £1 per share called up on the preference, £124.948 10s. paid, including £52 10s. on 104 preference shares forfeited. £125,000 considered as paid on the ordinary. Mortgages and charges: £96,600.

Penarth Electric Supply Co., Ltd. (52,912).—Capital, £50,000 in £10 shares (2,500 pref. and 2,500 ord.). Return dated May 11th, 1914; 2,500 ord. shares taken up; £10 per share called up; £25,000 paid. Mortgages and charges: £15,937.

Peterborough Electric Traction Co., Ltd. (74,562).—Capital, £60,000 in 6,000 pref. and 6,000 ord. shares of £5 each. Return dated May 6th, 1914; 4,400 pref. and 4,000 ord. shares taken up; £5 per share called up; £42,000 paid. Mortgages and charges: £21,000.

CITY NOTES.

Tyneside Tramways and Tramroads Co.

THE directors' report for the half-year ending June 30th, 1914, shows a surplus of receipts over expenses of £5,824, which, with the balance brought forward from last half-year of £388, makes a total to the credit of profit and loss account of £6,212, and after deducting interest on debentures, loans, &c., amounting to £1,011, there remains an available balance of £5,200.

The directors propose to pay dividends on the preference shares at the rate of 5 per cent. per annum (less income-tax), £601; on the ordinary shares at the rate of 3 per cent. per annum (less income-tax), £2,008; to place to reserve for renewals, depreciation, and other contingencies, £1,200, increasing the fund to £17,525. £330 is set aside for the reduction of registration and formation expenses, &c., and £1,060 carried forward to next half-year.

The traffic receipts show an increase of £986, as compared with the corresponding period of last year.

Stock Exchange Notices.—Applications to the Committee for official quotations in the following securities have been made:—

Auckland (City of).—£224,500 4½ per cent. electric power additional loan onds of £100, Nos. 1 to 2,245, in lieu of scrip.

Christchurch (City of).—£100,000 4½ per cent. electricity distribution loan bonds of £100, Nos. 201 to 1,200, in lieu of scrip.

The South American Cable Co. is re-organising under the title "Compagnie des Cables Sud-Americains," and will have its head office in Paris at 25, Rue de Clichy.

Brompton and Kensington Electricity Supply Co., Ltd.—The directors announce an interim dividend for the half-year to June 30th on the ordinary shares at the rate of 9 per cent. per annum (free of income-tax).

Lanarkshire Tramways Co., Ltd.—The twenty-sixth ordinary general meeting was held on Friday last at 83, Cannon Street, E.C., Mr. A. R. Monks presiding. The chairman formally proposed the adoption of the report (ELECTRICAL REVIEW, page 188), which was seconded by Mr. H. C. Levis, and agreed to.

Hydro-Electric Power and Metallurgical Co., Ltd.—A meeting of the holders of the first mortgage debentures is to be held at Winchester House, Old Broad Street, E.C., on August 19th to consider a resolution by which the debenture-holders agree to accept in discharge of their claims against the company in respect of principal moneys and of all interest from March 31st, 1914, Tasmanian Government 4½ per cent. bonds or stock at the rate of £95 for every £100 of debentures held. The balance of the moneys now in the hands of the trustees remaining after payment of expenses is to be applied towards payment of the interest due on April 1st, such payment to be made so soon as the trust has been finally wound up. The time for payment by the company of any balance of the interest due on April 1st is to be extended until three calendar months after the trust has been finally wound up.

France.—The report of the Compagnie Continentale Edison, of Paris, for last year shows a net profit of £184,096, as compared with only £146,348 in 1912. Of this sum £9,046 is being placed to reserve, £21,600 accorded to the directors, £96,000 distributed to the shareholders, and £50,400 to the holders of the founders' shares, leaving £7,050 to be carried forward.

Marconi's Wireless Telegraph Co., Ltd.—An extraordinary general meeting was held on Wednesday, at Marconi House, Strand; Commendatore G. Marconi in the chair, when a resolution relating to pension funds, &c., which was passed at the extraordinary general meeting held on July 21st, was confirmed as a special resolution.

Waste Heat and Gas Electrical Generating Stations, Ltd.—The directors have declared an interim dividend of 2½ per cent., less income-tax, on the issued share capital in respect of the half-year ending July 31st, 1914, payable on August 31st.

STOCKS AND SHARES.

Tuesday Evening.

THE Stock Exchange remains closed. Throughout the world, bourses and stock exchanges are shut, with the exception of the Paris official bourse, where transactions are being carried on in a few securities. Business in London and throughout the provinces has come to what is for all practical purposes a full stop. Whatever may happen, it is obvious that, when the Stock Exchange re-opens, business will be so materially reduced from that prevailing in the pre-war days as to necessitate continuance of living for a time on capital. A few bargains have been done this week in Consols, and the Government has been a buyer in the neighbourhood of 70. Outside these transactions, there have been a few scattered bargains, possibly not more than a score in all; and the newspaper statements of the amount of business which has been negotiated by telephone can be disregarded. So far as electric lighting issues are concerned, it may be stated that one of the principal firms in this department has not booked a bargain since the Stock Exchange closed on July 31st—which date, incidentally, seems to be very much more than a fortnight ago.

In the circumstances, it is mere waste of space to reproduce our ordinary lists of stocks and shares, with their prices. There are, of course, no reliable quotations available; and although it may be claimed that this or that paper offers facilities for public dealing, there is no market in the Stock Exchange sense of the word, which is a place where purchaser and seller can both be sure of meeting with men who will sell or buy at slightly different prices.

Anxious attention is bent upon the possibility of the Stock Exchange re-opening at an early date. All kinds of suggestions are being put forward, with a view to facilitating this consummation so desirable in the interests of many thousands of others besides those directly connected with the House itself. The broker sitting in his office day after day, contemplating outgoings what time he is not making a penny piece against them, knows well enough that his enforced inaction reacts upon the legal profession and a surprisingly large number of industries. At the same time, the remedy would be worse than the disease if premature opening of markets were to lead to the precipitation of financial panic on a scale commensurate with that of the present war; and the Committee of the House have every reason to walk most warily during the present crisis, in the interests of the community—in fact, of everybody throughout the world who is affected by the prices of securities.

As to these last, painstaking search shows that there are not many open sellers about. For the Debenture stocks of the electric lighting companies, for example, there are ready buyers in most cases. Either jobbers are short of stock, or they have brokers who have already professed their willingness to buy at reasonable quotations, and this means that dealings can be arranged on the basis of the prices published here last week. The buyer naturally would expect to get some advantage, and should be able to count upon obtaining stock a point or two below the nominal quotations. But up to the present, at any rate, there has been no forcing of a stock; while, on the other hand, desire is general to maintain levels, so far as may be, on the same plane as existed before the Stock Exchange closed.

In the case of shares, to take City of London Ordinary as an example, the last price was 16 middle. We would venture to guess that if anybody wanted to buy Cities just now, he would probably be able to get them in the neighbourhood of 15½ for cash; and, were he to come across a harassed holder, he might possibly get them cheaper. The same thing applies to the other markets, although in such speculative shares as Marconis, for instance, conditions, it seems hardly necessary to say, are different.

Everything is being done in order to facilitate the clearing up of whatever Stock Exchange bargains are open. Buyers and sellers alike are recognising that they can ease the whole situation by speeding their transactions, and the former, by Royal Proclamation, have to pay interest at the rate of 6 per cent. per annum if they elect to postpone payment, for purchases, until the expiry of the moratorium.

Considerable discussion is taking place quietly in various boardrooms as to whether directors shall pay or withhold dividends. Certain of the big railway companies set what seems to us an undesirable example in refusing to distribute the dividends which have been earned, and which, in the ordinary way, would have fallen due this month. Directors of such undertakings as have declared their half-yearly distributions have no difficulty in finding sound reasons for retaining the money, and so strengthening the financial position of their companies. On the other side of the shield, however, it is logical to urge that, where profits have been made, and are standing to the credit of a company in the bank's books, the money should be released, in order to alleviate the financial position as far as possible. It is not necessary to labour the fact that thousands of proprietors depend for a substantial part of their income on these dividends; and at a time when everybody is being exhorted to do what he can for the common good, we submit that undue hardship is inflicted by the withholding of such division of profits.

The manufacturing, lighting and other companies are bearing their burden with the rest in the matter of the war. All have lost a certain number of men, and as regards the electric supply undertakers, some have had machinery commandeered for the service of various Government departments. There is high authority for stating, however, that the metropolitan lighting companies can carry out all their operations in a normal manner, and that no fears are entertained for the regular supply of current to consumers—assurances that will be of comfort to shareholders and customers alike.

REVIEWS.

A Text-book of Physics: Electricity and Magnetism. Parts I and II. Static Electricity and Magnetism. By Prof. J. H. Poynting and Sir J. J. Thomson. London: Charles Griffin & Co., Ltd. Price 10/6 net.

This is a book suitable for fairly advanced students of physics—at any rate for those who have clearly passed their novitiate. The subject is developed along mathematical and research lines, theories being substantiated by facts, although neither the theories nor the facts have been carried to excessive limits. The authors had originally decided to treat of Magnetism and Electricity in a volume by itself, but it was found necessary to divide it into two. The present volume contains an account of the chief phenomena of electric and magnetic systems when they are respectively charged and magnetised. The effects of changes in the systems are only considered statically after the changes are effected, and the systems have become steady again. The phenomena accompanying the progress of change are treated in another volume now in the press.

Faraday's conception—developed mathematically by Maxwell—that there is an alteration in the material medium between electrified bodies is just as correct now as in the days when it was formulated. The authors very sensibly call this alteration "electric strain," and use it in preference to "electric displacement" or "electric polarisation." It is extraordinary what difficulty practical men find in thoroughly comprehending the terms "stress" and "strain." The definitions are quite simple and straightforward, and apply equally well to the mechanical and electrical branches of engineering. "Stress" is load or force of whatever kind it may be—tensile, compressive, shear, electric, magnetic, etc., per unit area over which the force acts; "strain" is the consequence of stress and is the dimensional alteration produced divided by the original dimension.

Part I of the book deals with static electricity. After an account of the common phenomena there is a chapter on the Inverse Square Law, and the student would do well to study it diligently, for this method of calculation also holds for magnetic and gravitative systems. Gauss's theorem, by which the intensities at a point in an electric field can in certain cases be obtained very simply, and which also shows that lines and tubes of force indicate the magnitude as well as the direction of the intensity at every point in their length, is clearly and easily proved. Then in the light of this theorem such propositions as a spherical shell uniformly charged, intensity at any point in the axis of a uniformly charged disc, intensity due to a very long uniformly charged cylinder near the middle, and so on, are gone into and solved. Other chapters deal with the electric field considered with regard to the induction or electric strain produced in it; the force on a small charged body in the field, and the pull outwards per unit area on a charged conducting surface; electrical level or potential; the energy in electrified systems; potential and capacity in certain systems and some methods of measuring them; the dielectric, specific inductive capacity and residual effects; relation of specific inductive capacity to refractive index; alterations observed in the dielectric when electrically strained; pyroelectricity and piezoelectricity.

Some of the line diagrams are a little rough. For instance, the curves on page 57 look as though they had been drawn with a very shaky pen. Again, the arrows, which are used to indicate directions, might be made to look more like real arrows. In all cases the barbs open out in a way that would make an engineering draughtsman ill. Small points, perhaps, when compared with the valuable text, but nevertheless worth putting right.

Part II—on Magnetism—first gives a general account of magnetic actions, and then considers the molecular hypothesis of the constitution of magnets, the latter being pretty exhaustively treated, and illustrated with many diagrams. It is pointed out that the molecular hypothesis only carries down the magnetisation from the visible mass of the bar as a whole to its molecular constituents and does not account for *their* magnetisation. Attempts to explain this last were in the early days made by Ampère with his circulatory electric theory, and later by Langevin and others with the "electron" hypothesis; but the matter is not yet satisfactorily cleared up. Then come Paramagnetics and Diamagnetics, magnetic fields, induced magnetism, stresses in the medium, and the measurement of permeability. The last chapter—on Magnetism and Light—is one of the most important in the book. It summarises what has been discovered about the interaction of the two from the time when Faraday first detected the rotation of a ray of plane-polarised light in the magnetic field.

The book contains 340 pages, and is beautifully printed and bound in the well-known manner of all Messrs. Griffin's publications.

W. J. C.

The Mechanical Engineer's Pocket Book, 1914. By D. Kinnear Clark and H. H. P. Powles. London: Crosby Lockwood & Son. Price 4/6 net.

In this, the eighth edition of our proven friend of the drawing office, a few necessary corrections and additions have been made, some tables have been extended, and new tables have been added to the appendix for convenience in converting atmospheres to lb. per sq. in., and *vice versa*, also for converting kg. per cu. m. to lb. per cu. ft. The table of equivalent Centigrade and Fahrenheit temperatures has been extended and Dr. Max Jakob's valuable curves relating to the average specific heat of superheated steam (for pressures from 2 to 20 atmospheres and temperatures up to 550° C.) are reproduced. The notes on Diesel engines and steam turbines remain as in the 1913 edition, and though not complete seem to present as much information as the mechanical engineer is likely to require. The general arrangement of the book remains as before; the short list of errata immediately following the preface should be noted. The mathematical and general tables and the mechanical engineering sections are above criticism. Not so, however, the fifty pages devoted to Electrical Engineering, which appear to have survived unchanged since the days when Nernst lamps were in their infancy and before arc and metal-filament lamps (even of the 1½-w. p.c. variety) were available to light the path of darkness. In its primary function as a pocket book for mechanical engineers, this work can be recommended confidently, but even the needs of mechanical engineers demand that the electrical pages of the book be brought up to date. Personally we believe that, apart from the question of obsolescence, a selection of electrical information much more useful to the mechanical engineer might be included in future editions.

Library Lighting.—The annual report of the Manchester Public Libraries Committee states that during the year electric light has been installed at Moston Library, and alterations have been made in the electric lighting at Longsight and Newton Heath. The last two are part of the rearrangement of the electric lighting which, together with the adoption of efficient lamps, since it was begun a few years ago, has reduced the cost of electrical energy by 50 per cent., a saving to the Committee of about £1,000 per annum.

THE PRESENT CONDITION OF AMERICAN ELECTRICAL INDUSTRY.

[BY A NEW YORK CORRESPONDENT.]

Some time ago an enterprising firm of New York utility operators, anxious to prove the stability of the light and power business, even through times of business depression, prepared and published a set of charts making a graphical comparison of the market position of various classes of securities—railroad bonds, public utility issues, and industrials. The facts which were therein developed brought out in a very striking way the extreme desirability of investment in the better grade of utility issues, and showed that, not only was there much less fluctuation with this class of security, but the risk of receivership was almost absent. Since that time these figures have been very widely quoted, and very effective use has been made of the conclusions which were indubitably to be drawn from the curves. Since that time, also, the investment market has witnessed a strong advance on the part of electric utility securities, until to-day such issues hold almost the foremost place among the lists of high-grade and really desirable investments.

The general industrial situation during the last twelve months has been such as to put to a searching test the claims of the operating firm in question and of all those who have been singing the praises of light and power securities as a stable investment; and it can be quite truthfully stated that the operating companies in the field, and the securities behind them on Wall Street, have more than justified the assertions which had been made. No one who has studied the figures of the earnings and output of the operating companies during recent months will assert that they are quite up to the high rate of increase which was found to obtain in some of the record-breaking years of the last decade; but at least the utilities have been showing large increases over last year, dividend rates have been maintained, and the market prices of the securities at the back of the properties have held up to previous figures in a very remarkable manner. Students of market prices and dividend rates have lately come to regard as commonplace the announcement in the financial Press that another railroad has been compelled to pass or reduce its dividend, and the situation in the field of industrials has not been a great deal better. Comparisons of the average price this year of twenty or thirty typical railroad bonds with the corresponding price of last year has invariably shown a woeful falling-off in realizable value, and if we were to judge the business condition of the country by the present condition of the finances of the main steam roads (as indeed it might be perfectly correct to do, although that is neither here nor there) we should certainly be led to the conclusion that the country was going through the worst period of stagnation which it had experienced for years. And yet when we turn to a study of operating statistics of the light and power utilities we find the indications of an entirely different state of affairs, and might indeed be excused for imagining that the land was enjoying a real boom.

The writer has had access to the monthly figures of earnings and output of the operating companies which are now being collected by the *Electrical World;* and, carrying the calculation right down to the most recent months, it has been shown that in 1914 the American light and power utilities are increasing their gross over last year at a rate which is better than ten per cent. A mean for the whole country might be eleven or twelve per cent.; while It would seem that the energy output of the central stations was some twelve to fifteen per cent. higher this year than last. In drawing conclusions from any of these figures the English reader should remember that there are in America greater possibilities for electrical expansion than any to be found in England, and also that these rates of increase, gratifying as they are, are perceptibly less than those established as normal by the 1907-1912 Government census. In the period 1902-1912 the light and power utilities in this country increased their gross earnings at an average annual rate of over twenty per cent., while even during the latter half of the ten-year period the rate was something over fourteen per cent. Nevertheless, this demonstrated expansion for the present year is very wonderful when we take into consideration the fact that the gross of the railroads is not only showing no increases, but in a very large number of cases is actually falling off.

It is therefore safe to draw the conclusion that, so far as the demand upon the electricity supply companies is concerned, the present year is seeing a healthy increase over 1913; but it must be pointed out that this is rather an index to the purchasing power of the communities than to the general health of the electrical industry. The supply companies are registering gains in earnings and income, but they are placing no heavy orders for equipment. The large increase in demand which is being placed upon the stations is being met by last year's apparatus and the previous year's apparatus. Whereas during the good times of a year or two years ago the plant factor (or the ratio of connected load to generating capacity) was fairly low for most sections of the country, the present year sees it rising and next year will see it still higher. At the present time (speaking broadly) the properties in the field are in excellent shape physically for meeting substantial increases in connected load and energy demand for some time to come; but the policy of the operating end of the industry has always been in the past to make ample provision for the future, and to see to it that the stations always have a good deal in hand in catering for the local demands. It can easily be seen that just now the manufacturers are by no means having a boom time, and they are eagerly and somewhat anxiously looking forward to the general uplift of the clouds of depression. The political situation this summer is not encouraging for the operating companies, and the good intentions of the Administration have not yet been so patently evidenced that any of the operators who can help it feel like making any heavy outlay for new plant. Most of them have sufficient physical equipment in hand to carry them safely along for a considerable time; and until things have taken a decided turn for the better the electric utilities will probably not be disposed to enter the market to any noticeable extent. The manufacturers meanwhile are working considerably below capacity, and the general condition of the electrical factories to-day is not such as to invite the Englishman to come over and try his luck. Workmen are, in many localities, serving on reduced time or being laid off altogether; while in some centres the office force, including commercial men, designers and draughtsmen, is being reduced. This condition is bound to continue for some months (at least) to come, although it may be confidently predicted that, when general business picks up and the supply companies feel that they can safely go ahead with all the financing that their properties require, the allied electrical industries will show the booming results to as marked an extent as any other set of interests in the whole country, and probably to a greater degree than most.

Of the various rates of growth which are this year being recorded in the different sections of the United States, the most considerable are coming from those along the south Atlantic seaboard, and indeed the demonstrated figures for the increase in energy output of the central stations there are such as actually to disprove any contention that the country is suffering from panic or anything resembling panic. After every allowance has been made for the most aggressive new-business campaigns, no one can

argue that the people of the southern states have been impoverished or are hoarding their money when it can be shown that the light and power companies are increasing their gross earnings at the rate of fifteen or sixteen per cent. as compared with last year, or that the industries of the south are dwindling and stagnating when it can be proved that the energy demand upon the stations is still growing at a rate of over twenty per cent. per annum. It was in the south that the most spectacular records were set up in the ten-year period 1902-1912, and all the indications at present are that the southern states are still to enjoy a period of industrial, and therefore electrical, health and prosperity. On the Pacific coast conditions are not so good, and all the available returns from that section of the country indicate that the coast states are still in the thrall of the depression from which they have been suffering for a long time. Some of the companies are returning rates of increase as high as ten per cent., but five and six are nearer the average, and that rate is not so high as it used to be and as it ought to be. The most satisfactory thing about the condition of the industry on the coast, however, is that the present is the worst time that can possibly be experienced, and that the early future is bound to see a great improvement. The last two years have been an anxious time for the directors of several large Western companies, and more than once they have come to the verge of embarrassment in carrying through their construction programme. The financing has now been successfully and skilfully carried out, and the properties are in magnificent shape for meeting vast increases in energy demand. The next few years will be comparatively plain sailing. The grilling work has been done, and provision has been made for the future commensurate with the infinite possibilities for expansion which reside in the Pacific states. As more and more of these possibilities are realized (and some of them cannot be long deferred) the supply companies will face the pleasant situation of having to assimilate heavy increases in gross without having to lavish big money on physical equipment. One would imagine that in California to-day there is sufficient installed generating capacity to take ample care of all the increase of population and industry in the next ten years.

ALL-STEEL DYNAMOS AND MOTORS.

It is a curious fact that although European manufacturers employed steel to a considerable extent in place of cast iron, in the construction of direct-current electrical machinery, for some years before steel was used in the States, it has been left to American manufacturers to carry this tendency to its logical limit and build what may be called—except as regards their insulated copper windings—"all-steel" dynamos and motors. In Europe cast steel was adopted in D.C. machines because it was magnetically a better material than cast iron but in America it has been recognised that steel is the better material magnetically and mechanically for every part of D.C. and A.C. machines in which cast iron has hitherto been employed. Where wages are high and large numbers of standard machines are to be produced, the advantages of steel are particularly great.

The following figures (extracted from curves presented by G. Pontecorvo in *Elek. Zeitschrift)* compare the magnetic properties of cast iron, cast and rolled steel, and show the advantages of the latter materials in this respect:—

Amp. turns per Cm.	Flux per Sq. Cm. Cast-iron.	Cast-steel.	Rolled steel.
5	2,500	9,000	12,000
10	3,600	12,000	14,000
20	5,500	13,800	15,800
30	6,400	14,600	16,500
50	8,000	15,800	17,400
100	10,000	17,000	18,500
150	12,000	17,800	19,400

The saturation curve for rolled steel is practically coincident with that of forged steel and is considerably better than that of cast steel. Further, the rolled metal is free from blow-holes and stronger than cast steel (see subjoined data); hence, on both grounds, its section can be considerably reduced as compared with cast steel or iron:—

	Max. Tensile Strength. lb. per Sq. In.
Cast-iron	15,000
Parts of cast-iron	10,000
Cast-steel and parts thereof	56,500
Rolled steel	60,000

Despite the reduced mechanical and magnetic factor of safety permissible where rolled steel is employed, the loss by breakage is lessened and the time required to dress castings is completely eliminated.

It must be clearly understood, however, that rolled steel can be used economically only by a firm turning out such large numbers of standard machines that it can afford to install costly special tools (punches and presses, etc.). To make the yoke or frame of a dynamo or motor, a rolled steel plate (of thickness determined by the flux subsequently to be carried in D.C. machines and by purely mechanical considerations in A.C. machines) is cut into strips. After punching ventilating holes the plates are made red-hot, bent to form a closed ring, and welded electrically in the case of D.C. machines. It is not necessary to weld the joint in A.C. machines. Yoke pedestals and bearing brackets are built of punched and pressed steel, as also are slide rails and bed-plates. The hydraulic press used to bend the foot and bearing bracket punchings exerts a maximum force of 1,000 tons, and can make 150 strokes per minute; it bends a foot bracket from $6\frac{1}{4} \times 48 \times \frac{1}{2}$ inch plate in a single stroke. Such a machine costs £4,000. It is preferable to a hammer in that the latter acts chiefly on the surface of the work. By suitably designing the press tools it is possible to give thin steel parts the appearance of being as massive as the cast-iron parts to which they are mechanically and electrically equivalent. A few rivets, suitably located and closed by machine, unite quickly and permanently those parts needing to be so joined. Narrow A.C. machines have no ring shell but simply a pressed steel ring at each end, holding the laminations and serving for attachment of the bearing brackets.

The wholesale production, necessary to make economical the above method of manufacture, requires elaborate arrangements for handling, storing and testing parts and finished machines. Several hundred motors ranging from 0.37 to 185 KW. were tested in various works for many months before commercial manufacture was commenced. The strength of the riveted foot joints was proved by gear- and crank-driving a shaft carrying a heavy eccentric load. Dropping a complete motor from a considerable height did no more damage than to bend one foot.

Other innovations in the new method of construction include the use of pressed brush-holders, steel slip rings (in A.C. machines) and steel tube journals slotted for oil rings and run in with white metal. About 80 per cent. of the total number of induction motors in America have squirrel cage rotors and, to be uniform with the all-steel frame and housing construction, a rotor construction has been evolved in which the bars are mounted in an insulating and heat-hardening cement and connected circumferen-

tially by a cast-on ring. Such rotors are practically indestructible, and all-steel motors of every type should prove very useful wherever strength and lightness are of special importance.

NEW ELECTRO-MAGNETIC HAMMER.

In contrast with the rapid progress made in electric driving of other machine tools, no thoroughly satisfactory means have hitherto been evolved for electric operation of percussion tools. Chipping and riveting hammers are indispensable in structural work of any kind, and it is not unusual to find air compressors installed to supply them where electricity is used for lighting and all other power applications. A satisfactory electromagnetic hammer would save the capital cost of such a special air equipment and eliminate the losses due to inefficient tools, poor load factor and leakage, etc. The direct application of electromagnetic attraction to a core acting as a hammer is not feasible since breaking the field circuit after each blow involves very slow working or violent sparking, which quickly destroys the contacts. Depocle produced an oscillating field in a solenoid by combining direct and low-frequency alternating current fields, but the hammer and special dynamo required were complicated and slow working. Many crank-driven hammers have been produced, and in most of these a spring is used to store energy till it is required for the hammer below. The spring is not durable and the equipment is heavy, a 120-watt crank-driven hammer to deliver 1,500 blows per minute weighing 30-33 lb., as compared with 11 lb., the weight of an equivalent air hammer. The use of a flexible shaft saves weight on the tool itself but introduces inefficiency, and leaves the operator to resist the torque transmitted.

A hammer recently placed on the American market uses a crank driven electromagnet, the armature of which constitutes the hammer; the magnetic field is used to store energy supplied by the motor. Obviously, for the sake of simplicity, cheapness and light weight the magnet should serve at once as source of energy and energy reservoir. Attempts to prevent sparking at the contacts of a simple "on" and "off" solenoid, by the use of condensers, resistances and magnetic blow-outs have been unsuccessful. The back e.m.f. of the magnet winding acts in series with the line pressure at the moment of breaking circuit and, in the case of a 120-watt hammer delivering 17 blows per second and storing, say, 20 per cent. of the useful energy in its magnetic field, 1.4 watt-secs. has to be dissipated during say 0.008 sec., *i.e.*, the breaking spark represents 180 watts and is repeated 27 times per second. Actually it is hardly possible to break contact quickly enough to work at this frequency.

Instead of attempting to dissipate (without damage) the energy stored in the field by opening the field circuit, L. Schuler seeks a solution analogous to the use of the interpole, instead of resistance commutation, in dynamos and motors. This solution requires the use of alternating current. In 1889 Marvin devised a simple hammer oscillating between two coils alternately excited by alternating current. It was possible, but difficult, to interchange the field connections at the moment of zero current. A special 20-cycle alternator was required, and the return of the hammer being as rapid as its outward motion, equal energy was consumed on working and return strokes.

The Schuler hammer* (Fig. 1) employs alternating current and a synchronous contact maker which opens and closes the field circuit, in synchronism with the current used, once per period and always at the moment of zero pressure. In a purely inductive permanently closed circuit the alternating current E would produce a pulsating but unidirectional current i. Actually the theoretical current curve i (Fig. 2) is distorted to the form of i^1 by presence of resistance and gradually comes into quadrature with E. The first current wave has, however, almost double amplitude and double period, and therefore quadruple working power. Probably for the first time that switching-in phenomenon, which gives so much trouble in transformer and induction motor practice, now finds useful application.

By suitable design the current and field i in the neighbourhood of point 20 (Fig. 2) can be made so small that no appreciable sparking occurs. The current curve cutting the axis at small slope and while the pressure is low, very accurate setting of the contact breaker is unnecessary. The small negative current is actually advantageous in destroying remanant magnetism and preventing sticking of the magnet. Energy stored in the field iron is recovered before the circuit is broken. By extending the return of the armature over two periods, the energy required (which varies with $1/\sqrt{\text{time}}$) is made so small that it can be supplied by a spring. The latter reduces the useful blow by only a few per cent. On 50-cycle supply the hammer strikes 50 blows in three seconds, and by using a 3-way synchronous distributing switch, three hammers can be made between them to utilise each and every cycle of the supply current. Unless the generator has six, or a multiple of six poles, or unless a synchronous distributor is used, the contact maker must be suitably geared to the generator shaft.

The form of core illustrated in Fig. 1 reduces the air path practically to the main gap, energy in which can alone be utilised efficiently. Wattless current and the corresponding copper loss are a minimum, and the position of the main gap between the field coils makes the leakage field as small as possible. Actually it is at least 60 per cent. of the effective field, and must be allowed for in design; the reduced leakage as the armature descends increases the pull on the latter though the total flux is already decreasing. The pivoted striker

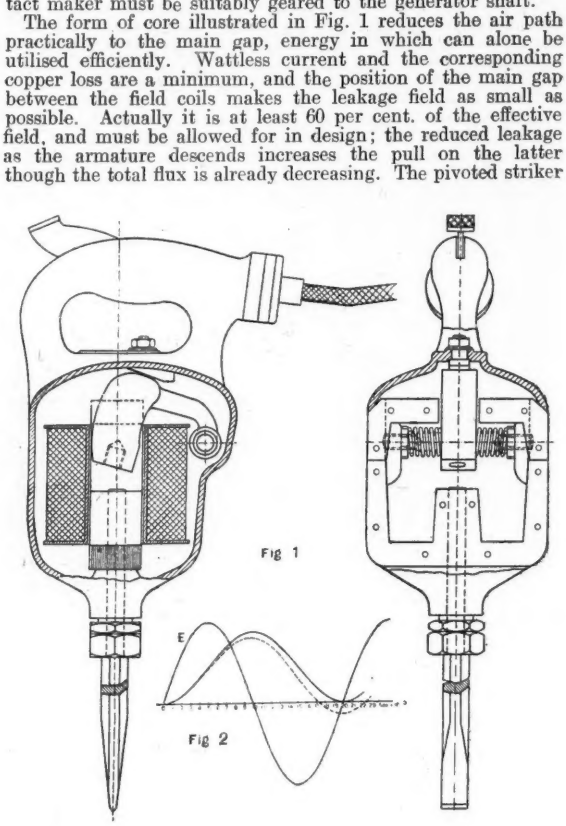


Fig 1

Fig 2

—armature is carried between steel points which offer little bearing friction and permit accurate adjustment og the armature. The elevation of the tool bar above the central stationary limb of the yoke need be very small, hence little energy is incapable of utilisation in the "clearance" depth of the gap. A detailed example of the electromagnetic design of a hammer of this type is to be found "E.T.Z.," pp. 589-593, 1914. In order that weight and heating may not be excessive, it is necessary to build electric tools of high efficiency even where the cost of energy is of quite secondary importance. The efficiency of an electric hammer delivering 17 blows per second (mean force during 0.4-inch hammer stroke = 104 lb.) is about 60 per cent, whereas that of an equivalent air hammer, including compressor and pipe losses, does not exceed 10 per cent. The total weight of the electric hammer is 13¼ lb. (4 lb. active iron, 4¼ lb. copper) and that of the air hammer about 11 lb.

*Described in the *Elek. Zeitschrift*.

AUTO-REGULATOR SYSTEM FOR DIRECT CURRENT TRACTION.

The Metropolitan Railway Co., of Paris, has successively used various multiple unit control systems on its trains, and has recently tested an auto-regulator system which eliminates loss in starting resistances and which provides for regenerative braking. The new system is derived from the well-known Ward Leonard system which, as applied to electric traction, places in series with the train motors a reversible booster capable of adding to or subtracting from the line voltage. In the present case, the regulator set comprises a constant-current machine and a small exciter both driven by one constant-speed compound motor. The regulator machine has two field windings excited respectively in shunt across its own terminals and by a constant current from the supply network. Starting is effected by increasing gradually the pressure applied to the main motors; during running, the current through the latter is held practically constant by the regulator machine; and during retardation, the regulator secures return to the network of a considerable part of the kinetic energy of the train.

Regulator Characteristics.—**In fig. 1, potential difference at the regulator brushes is represented by ordinates Y Y′ and ampere-turns excitation is represented by abscissæ X X′. The characteristic due to the shunt-winding on the regulator is represented by a line O E, and by varying the resistance of the shunt field circuits the slope of this line can be made to coincide with that of the open circuit characteristic O B, which is practically a**

straight line while the magnetic circuit is unsaturated. The shunt field winding is so connected as to produce in the regulator armature an E.M.F. equal and opposite to the P.D. applied to the brushes. Whatever the latter, so long as the limit of saturation is not reached, the machine neither receives nor discharges current (in respect of the shunt field and the applied P.D.). The separately excited field coil produces an effect depending on the direction of current flow through it; if its ampere-turns aid those of the shunt winding, the armature delivers current to the supply network. If V represents the regulator terminal P.D.; E_1, H_1, the E.M.F.'s generated by the shunt and independent field windings respectively; I, the current and R, the armature resistance, then— $E_1 - V + H_1 - I, R = 0$, but since E_1 always $= V$, this equation reduces to $H_1 = I, R$. In fig. 1, A B represents the E.M.F. (equal and opposite to V) due to the shunt ampere-turns O A; the

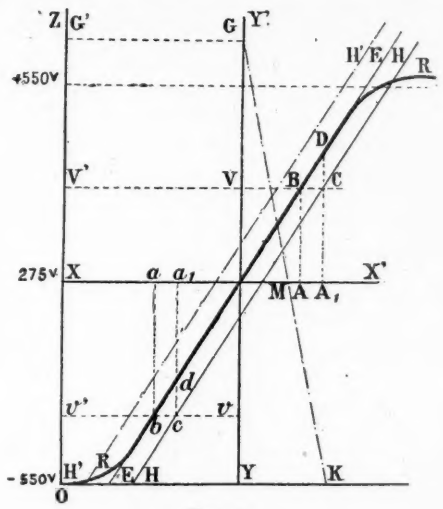


FIG. 1.

ampere-turns A A′ of the independent field winding aid those of the shunt winding, the total armature E.M.F. is represented by A_1 D, and the increase C D due to the independent field winding $= H_1$ and is constant. In other words, the point C, as V varies, lies on a straight line H H, parallel to O E; since H_1 ($=$ C D $=$ I, R, the line H H represents the variations in current delivered. If the independent winding opposes the shunt winding, the machine operates as a motor, the locus of the points C being again parallel to O E, but situated above the latter (as H H′ fig. 1). Within the limits indicated the regulator operates automatically as a constant current generator or motor, according to the magnitude and direction of the independent excitation, and irrespective of the P.D. applied to its brushes. The machine to which the regulator is coupled operates as a dynamo or motor, according as the regulator motors or generates.

Action During Starting.—In the simplified diagram of connections fig. 2, referring to a motor-car with two motors, X represents the supply line, G the earth, M_1 M_2 the traction motor armatures, m_1 m_2 the series fields of the latter, F_1 F_2 the regulator and machine direct coupled to the latter, E H the shunt and independent field

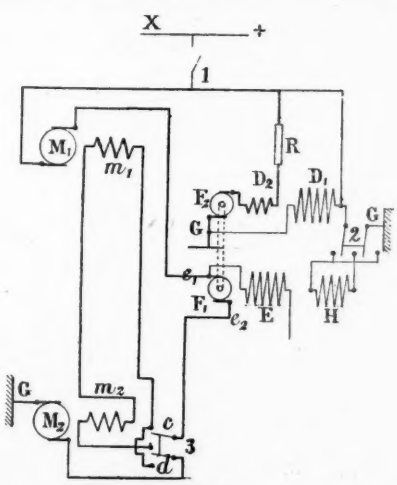


FIG. 2.

winding of F_1, and D_1 D_2 the shunt and series field windings of F_2. The regulator armature is connected between and in series with the traction motors.

On starting, the switch 1 is closed after placing the change-over switch, 2 so that H opposes E and causes F_1 to run as a motor. The group F_1 F_2 is then started by aid of the variable resistance R. Current now flows through E in series with M_1 M_2, but the reversing switch 3, connecting the field coils m_1 m_2 is not closed till F_1 F_2 has attained full speed and the regulator E.M.F. is practically equal, and opposite to the line voltage, so that no heavy current rush occurs at the moment of completing the main motor circuit. The actual value of the current flowing through the regulator, and, therefore, through the traction motor, is determined by the excitation of H. During this period, the machine F_2 runs as a generator and returns to the line a current slightly less than that absorbed by F_1 (owing to losses in F_1 F_2). As the motors M_1 M_2 speed up, the P.D. between e_1 d is reduced, but since the E.M.F. produced by E decreases simultaneously, automatically and by the same amount, the current flowing through M_1 F_1 M_2 remains constant. At a certain moment during acceleration, the applied P.D. between e_1 and d is zero; at this moment, the motors M_1 M_2 are essentially in simple series between X and G, and it would be possible to place F_1 F_2 out of circuit without affecting the main motors. If F_1 F_2 be left in service, the main motors continue to accelerate, and there is established a P.D. between e_1 d in the opposite direction. The current in E is then reversed, F_1 operates as a generator and F_2 as a motor. The winding E continues to balance the E.M.F. applied to e_1 d, and the winding H maintains constant current flow in the circuit M_1 F_1 M_2. Ultimately E adds to the supply pressure an E.M.F. equal to the latter; the motors M_1 M_2 are each subjected to the full line voltage, and could be connected in simple parallel between X D, the set F_1 F_2 being shut down. On the Metropolitan Railway, since the stations are close together, the regulator is permanently connected to the network, and during coasting and stops the switch 3 is opened.

Regeneration.—By reversing the switch 2 in the independent field circuit of the regulator machine, the regulator E.M.F. due to H is opposed to the line pressure. The switch 3 being set so that M_1 M_2 operate as dynamos, the resultant E.M.F. in the circuit M_1 F_1 M_2 exceeds and opposes the supply pressure, hence the train is retarded by the conversion of its kinetic energy into electrical energy which is delivered to the supply network.

Two distinct periods are to be recognised during regeneration, viz., a short period during which regeneration is established, the speed of the traction motor being practically constant; and the remaining period of regeneration, during which the current has its normal value. At the moment when regeneration is established by closing the switch 3, the P.D. applied to the regulator brushes varies almost instantaneously over a wide range; even during the subsequent period of regeneration the rise in E.M.F. of the series generators following any accidental increase in current, leads to further current increase, and hence to unstable operation, unless special provision be made to prevent it. The trouble being due to the low self-induction of the motors, the simplest remedy is to provide suitable damping in the traction motor field circuit. This is done by shunting the latter with the armature of an auxiliary exciter machine direct coupled to the group F_1 F_2, and hence running at constant speed. One field winding on the exciter is connected across the supply mains and produces constant E.M.F.; the other field winding is connected across the regulator terminals, and, therefore, produces E.M.F., varying in direction and magnitude with the P.D. applied to the regulator, *i.e.*, with the main motor speed. This arrangement does not disturb the series characteristics of the traction motors, the torque of which increases as the speed decreases, and, being a maximum at standstill, produces smooth and complete braking. Different rates of retardation are obtainable by varying the independent excitation of the regulator machine. At high speeds the regulator runs as a motor, but at low speeds, it operates as a generator; the current returned to the mains decreases progressively as braking proceeds.

The three auxiliary machines required by the auto-regulator system weigh about 4,070 lb.; contactor switchgear is, of course, employed, but eight fewer contactors are required than in the Sprague-Thomson multiple-unit system, and the usual heavy starting resistances are completely eliminated, so that the net increase in weight is only about 3,080 lb. in the new system. This represents only 3 per cent. increase in the total weight of a 150-ton (3 motors + 2 trailers) train.

It is claimed that the auto-regulator system effects about 30 per cent. saving in energy in tube service, and it is estimated that its adoption on all the Metropolitan (Paris) trains would reduce the annual energy consumption by about 20 million KW.-hours. The present expenditure of this energy represents loss of money and useless heating of the tunnels. At present there accumulates in the latter about 500 tons per annum of metallic dust—chiefly the products of abrasion during braking. This dust adheres to the oily substances and surfaces of the rails, ballast and insulators, and is difficult to remove. Regenerative braking would obviate the nuisance by eliminating its cause.

The Electric Vehicle in France.—Following the example set by this country, a movement has been commenced with the view of bringing about a revival of interest in electric motor vehicles in France. M. Dubournais, of the Société Gastambide, suggests that the French Automobile Club should take the matter up, and endeavour to induce central station authorities to make provision for the charging of automobile batteries, not only promptly but also at a reasonable charge.

NEW PATENTS APPLIED FOR, 1914.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electric Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

17,684. "Terminal or attachment fittings of electric conductors." H. Edmonds (trading as G. Edmonds). July 27th.

17,686. "Compound for making water-tight the joints of covers of boxes for underground electric mains and distributors and similar joints of boxes fixed in exposed positions." W. H. Walker. July 27th.

17,705. "Sparking plugs." R. Colin. July 27th.

17,707. "Magnetic blow-out device for safety fuses." A. Mond. (Maschinenfabrik Oerlikon, Switzerland.) July 27th. (Complete.)

17,732. "Electric thermostatic fire-alarm contacts." H. Dixon. July 27th. (Complete.)

17,733. "Electric metallic incandescent lamp." K. Kende. July 27th. (Complete.)

17,745. "Process of rolling metal." S. O. Cowper-Coles. July 27th.

17,746. "Process for the electro-deposition of lead." S. O. Cowper-Coles. July 27th.

17,747. "Process for coating or plating metal sheets with other metals by electro-deposition." S. O. Cowper-Coles. July 27th.

17,755. "Writing or copying telegraphy." Telepantograph G.m.b.H. July 27th. (Convention date July 28th, 1913, Germany.) (Complete.)

17,761. "Air conditioning apparatus." A. F. Berry. July 27th.

17,762. "Electrical heating apparatus suitable for cooking, water heating and like purposes." A. F. Berry. July 27th.

17,763. "Electrolytic production of alkali metals." J. Y. Johnson (Badische Anilin & Soda Fabrik, Germany). July 27th.

17,768. "Measuring of continuous electric current." E. Besag. July 27th. (Convention date, August 20th, 1913, Germany.) (Complete.)

17,797. "Socket terminals for electric conductors." W. A. Hill. (Apparate Bauanstalt Fischer G.m.b.H., Germany.) July 28th.

17,811. "System for the generation of electric currents." C. F. Benitez. July 28th. (Complete.)

17,836. "Means for detecting or recording electric currents. T. Illingworth and W. C. Mann. July 28th.

17,850. "Means for electrically determining transmitted power." W. E. McCoy and S. D. Strong. July 28th. (Complete.)

17,851. "Transformer motors." D. Suchostawer. July 28th.

17,863. "Contact apparatus particularly for telephone systems." F. Brinkmann. July 28th. (Convention date, August 9th, 1913, Germany.) (Complete.)

17,872. "Construction of high-frequency alternators." Soc. Marius Latour et Cie. July 28th. (Divided application on 26,934/13.) Convention date, November 27th, 1913, Belgium.) (Complete.)

17,894. "Electric motor control." British Thomson Houston Co., Ltd., and H. C. Hastings. July 28th.

17,909. "Electric furnaces." J. L. Dixon. July 29th.

17,920. "Telegraph circuits." A. Orling and Orling's Telegraph Instruments Syndicate, Ltd. July 29th.

17,924. "Insulated lamp-holder for electric lamps." L. S. Hearlin. July 29th.

17,945. "Electric heaters." R. Weaving, F. Smith, and Ferranti, Ltd. July 29th. (Complete.)

17,949. "Starting switches or controllers for dynamo-electric machinery." Siemens Schuckertwerke G.m.b.H. July 29th. (Convention date, July 29th, 1913, Germany.) (Complete.)

17,986. "Electric time switches." J. E. H. Beraud. July 29th. (Addition to 945/14.) (Complete.)

17,988. "Multiple-contact electric switches." H. J. Norballe and J. L. Lawson. (July 29th.) (Divided application on 23,127/13. October 13th.)

18,009. "Sender for Hertzian waves with polyphase generators." V. Bouchardon. July 30th. (Convention date, August 1st, 1913, Germany.) (Complete.)

18,011. "Electrical equipment of motor cars." H. Garner and W. J. Parker. July 30th.

18,023. "Process for enriching or activating liquids or gases with radium emanation." E. Schwarz. July 30th. (Convention date, July 30th, 1913, Austria.) (Complete.)

18,033. "Telephone systems." J. G. Blessing. July 30th. (Convention date, July 31st, 1913, United States.) (Complete.)

18,042. "Electrically-driven machine tools having several tools." H. Kienzle. July 30th. (Convention date, August 1st, 1913, Germany.) (Complete.)

18,043. "X-ray apparatus." H. W. Cox & Co., Ltd., and H. E. Donnithorne. July 30th.

18,060. "Closing devices for conduits." Soc. dite M. Goudard et Mennesson July 30th. (Convention date, November 21st, 1913, Belgium.) (Complete.)

18,064. "Telephone and like apparatus." F. W. Lanchester. July 30th.

18,076. "Selecting devices for automatic or semi-automatic telephone systems." G. A. Betulander. July 30th. (Convention date, August 1st, 1913, Sweden.) (Complete.)

18,092. "Electric accumulators or secondary batteries." F. A. Coles. July 31st.

18,106. "Electric current graduating devices or resistances." W. Sumner. July 31st. (Complete.)

18,123. "Signalling arrangements for use with projectors or searchlights." Siemens Schuckertwerke G.m.b.H. July 31st. (Convention date, July 31st, 1913, Germany.) (Complete.)

18,143. "Electrical conduit systems." M. J. Railing and T. Taylor. July 31st.

18,154. "Selecting-devices for automatic or semi-automatic telephone systems." Gotthilf Ansgarius Betulander. July 31st. (Addition to 18,076/14.) (Complete.)

18,155. "Mattresses for insulating purposes." J. A. Dick. July 31st.

18,184. "Switch-gear for controlling the motor which operates the feed-screw of electrically-operated reciprocating tools." Lancashire Dynamo & Motor Co., Ltd., and W. Hargreaves. August 1st.

18,202. "Step-by-step mechanism suitable for starting electric motors." Sir W. G. Armstrong Whitworth & Co., Ltd., and W. H. Waddingham. August 1st.

18,203. "Wireless telegraph direction-finders." Marconi's Wireless Telegraph Co., Ltd., and E. Ichino. August 1st.

18,238. "Manufacture of fittings and accessories for electric and other lamps and illuminating devices." W. J. Owen. August 1st.

18,239. "Telephone installations." Siemens & Halske Akt. Ges. August 1st. (Convention date, August 4th, 1913, Germany.) (Complete.)

18,242. "Transmission of electrical impulse circuits of high electrostatic capacity." G. Musso. August 1st. (Addition to 17,246/14.) (Complete.)

18,243. "Apparatus for transmission of electric impulses." G. Musso. August 1st. (Addition to 17,245/13.) (Complete.)

18,244. "Storage battery plates." M. Krokavetz. August 1st.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1913.

13,820. Electrical Connection Devices for Railway and like Vehicles. L. Boirault. June 14th. (July 29th, 1912.)

15,875. Arrangement for Starting Groups of Electrical Machines, consisting of a Synchronous Machine and an Asynchronous Machine connected in cascade with it. (March 21st, 1913.) July 9th. Ateliers de Constructions Electriques de Charleroi, Soc. Anon.

15,928. Synchronisation of Clocks. I. H. Parsons and A. E. J. Ball. July 10th.

16,187. Arrangements for Controlling the Quantity of Heat supplied to Heating Radiators. M. Arndt. July 14th. (July 15th, 1912.)

16,198. Electrically-operated Rotary Constant-speed Device. R. P. Howgrave-Graham. July 14th.

16,257. Electric Miners' Lamp with Fire-lamp Indicator. J. C. Rigaux. July 15th.

16,298. Receivers for Submarine Sound-signals. Signal Ges. July 15th. (July 29th, 1912.)

16,380. Adjusting and Supporting Means for the Stretched Threads of Electric Measuring and Indicating Apparatus. C. Lorenz Akt. Ges. July 16th. (June 20th, 1913.)

16,392. Electric Dinner or Service Lifts. F. Hodgson. July 16th.

16,538. Automatic and Semi-automatic Telephone Systems. Siemens & Halske Akt. Ges. July 18th. (September 10th, 1912.)

16,549. Devices for Recording Sounds. E. Costantini. July 18th, (December 18th, 1912.)

17,453. Electric Cooking and Heating Apparatus. C. Clarke. July 30th.

17,589. Control of Alternating Current Motors. Siemens Schuckertwerke Ges. July 31st. (August 2nd, 1912.)

18,673. Arrangements for Exciting Rontgen-ray Tubes. Siemens Bros. & Co. (Siemens & Halske Akt. Ges.) August 16th.

22,222. Manufacture of Electrodes for Electric Arc Lamps. F. Lewis. October 2nd. (July 2nd, 1913.)

23,277. Magnetic Motor. E. W. Fuller. October 15th.

23,698. Dynamo-electric Machines for use on Motor Vehicles. H. K. Kouyoumjian. October 20th. (July 19th, 1913.)

23,867. Rocker Arms and Brush Holders for use on Electrical Motors and Generators. J. Leech. October 21st.

24,899. Construction of Electric Snap-action Switch. E. M. Wildey. November 1st. (Divided application on 1,471/13. July 18th.)

25,668. Apparatus for the Preparation of Electric Baths. J. Duiven November 10th. (November 13th, 1912.)

25,774. Method and Apparatus for Electric Code Impulse Signalling Systems. Western Electric Co. (Woodward, acting for Western Electric Co.) November 11th.

27,354. Regulation of Dynamo-electric Generators. F. L. Hollister. November 27th. (Divided application on 28,748/12. December 13th.)

27,365. Manufacture of Anodes of Massive Manganese Peroxide. Siemens & Halske Akt. Ges. and Huth. November 27th. (Addition to 605/09.)

27,679. Telephonic Instruments. E. A. Graham. December 1st.

28,051. Apparatus for Exhibiting Symbols, Pictures and the like. F. Moreno. December 5th.

28,126. Means for Indicating Change of Temperature. I. Hall. December 6th

28,950. Magnetic Balances. R. W. Paul. December 16th.

1914.

373. Electric Apparatus for Heating Liquids. J. Von Hentzel. January 6th.

1,641. Automatic Switches for use in Telephone Exchange Systems. Western Electric Co. (Woodward, acting for Western Electric Co.).

2,023. Transportable Military Telephone. E. Schuler & G. Schuler. January 26th.

2,075. Common Battery Telephone Systems. Western Electric Co. (Woodward, acting for Western Electric Co.). January 26th.

2,693. Automatic Switches for Telephone Systems. Western Electric Co. (Woodward, acting for Western Electric Co.). February 2nd.

3,232. Frequency Transformers. W. P. Thompson (Goldschmidt). February 7th.

3,649. Electric Switches. Igranic Electric Co. (Cutler Hammer Mfg. Co.). February 12th.

5,096. Number Plates and Rear Lights for Motor Vehicles. W. H. Bishop. December 27th.

5,281. Wireless Oscillator. H. P. Dwyer. March 2nd.

6,079. Devices for Recording Sounds. E. Constantini. July 18th. (December 18th, 1912. Divided application on 16,549/13. July 18th.)

6,418. Electric Condensers. Allgemeine Elektricitats Ges. March 13th. (March 14th, 1913.)

8,975. Electric Signalling Devices for use with Winding Engines of Collieries. J. A. Adlington. April 9th.

9,232. Electrolytic Apparatus. W. Thum. April 14th.

9,492. Electric Switches. W. M. Rolph. April 16th.

Foreign Trade in July.—The following are the electrical and machinery figures given in the official returns for July trade:—

Imports.	*Month of July*	*Inc. or dec.*	*Seven months, 1914.*	*Inc. or dec.*
	£	£	£	£
Electrical goods and apparatus, excluding machinery and uninsulated wire ...	139,346	+ 16,658	943,991	+ 75,174
Machinery	632,932	− 1,012	4,777,276	+385,594
Exports.				
Electrical goods and apparatus, excluding machinery and uninsulated wire ...	354,405	−154,678	2,058,634	−1,133,260
Machinery	3,304,888	+173,202	22,774,443	+1,218,214